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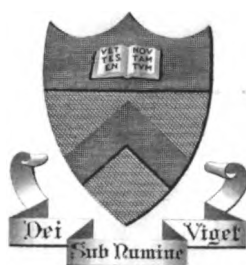
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AND OF ELECTRIC SCIENCE.

VOLUME VII.

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INDEX TO VOLUME VII.

Articles in SMALL CAPS are Illustrated.

	Page		Page		Page
A Big Corporation,	281	Argument of Mr. G. P. Lowrey upon the Postal		Comparative Statistics of Government Tele-	
A Bill to protect Telegraph Lines,	152	Telegraph Bill,	292, 329, 345, 354, 375	graphs for 1872,	247
A Bold Forgery,	70	Art of Printing first practised in China,	260	Conductibility of Magnetic Tensions,	197
A Cruel and Heartless Hoax,	185	Assessing the Capital Stock of Corporations,	228	Conductivity of Metallic Vapors, The	276
A Husband's Message,	361	Astronomy First Studied,	260	Conference of Telegraph Companies,	229
A Marriage by Telegraph,	135	Atmospheric Telegraphy,	275	Congratulations,	249
A Molecule of Substance,	135	Australian Savages attacking Telegraph Sta-		Constants of Nature,	309
A New Art in War,	10	tions,	147	Constructing Electro-Magnets,	218
A New Battery Couple,	243	Automatic Telegraphy,	277	Correspondence—7, 23, 39, 52, 68, 84, 100, 116, 132	
A New Galvanic Battery,	10	Banks First Established,	314	148, 164, 180, 196, 212, 228, 244, 260	
A New Invention in Telegraphy,	295	Battery—A Lead and Zinc,	101	276, 298, 308, 324, 340, 356	
A New Submarine Atlantic Cable Scheme,	39	Fein's Galvanic,	36	Correspondence regarding Government Rates, } 185	
A NOVEL DEVICE,	275	Behavior of Non-Conducting Substances un-		Cure of Rheumatism in a Horse by Electricity, 101	
A Problem,	7	der the influence of Electrical Forces,	59	Damage to Wires by Storm,	23
A Simple Method of Generating Electricity,	342	Be Just,	138	Death of E. S. McDill,	327
A Spark Adjuster for the Holtz Machine,	242	Births, Marriages, and Deaths—9, 22, 38, 55, 70, 905		Death of Samuel Vance Orton,	136
A Suggestion,	100	102, 118, 134, 150, 166, 183, 199, 214,		Death of Samuel Porter,	73
A Telegraphic Blunder and what came of it,	281	230, 263, 279, 295, 310, 330, 342, 358, 375		Decay and Preservation of Timber for Tele-	
A Theory on the source of Terrestrial Magnet-		Block System of Railway Signals, The	311	graphic Purposes,	211
ism,	179	Boarding Telegraph Operators,	153	Decision of the Postmaster-General regarding	
Action of Cincinnati Telegraphers on the death		Bogus Messages,	276	Government Messages,	39
of George H. Everett,	118	Burning of the Helena (Mon.) Office,	23	Dedication of the New General Post Office,	
Action of Electricity on Flames,	59	Cable Communication between Jamaica and		London,	43
Action of Light on the Electric Resistance of		Porto Rico,	87	Deperdition of Magnetism,	163
Selenium,	135	Cable Communication with Japan,	276	Depth of the Magnetized Layer in a Bar of Steel, 211	
Activity of Telegraphic Correspondence in		Cable Soundings in the Pacific,	258	Determination of the Time of Oscillation of a	
1871,	167	Cable, Breaking of the Atlantic of 1866,	120	Material Pendulum,	179
Adhesion,	214	Cuba Submarine,	197	Dielectricity of Insulators,	275
Advantages of the Telegraph in war,	199	Demerara, Delay in Completion of,	263	Difference of Physiological Action of Induced	
Amber,	87	Direct United States,	329	Currents,	58
American Electrical Society, The	326	Projected between Aspinwall and		Direct Spanish Telegraph,	103
American Electrical Society's Constitution,	325	Santa Martha,	871	Directory of the W. U. Tel. Co.,	169
An Acknowledgment,	23	Projected between Callao and Islay,	327	DIVIDING OF THE CURRENT INTO BRANCH	
An Arithmetical Problem,	100	Projected between Peru and Chill,	87	CURRENTS,	369
An Electrical Desert,	121	Sydney and New Zealand,	268	Dr. Priestley and the Voltaic Pile,	276
An Embarrassed Telegrapher,	121	The Asiatic,	38	Drafted Operators in Cuba,	120
An Honor to Prof. Henry,	4	The New Porto Rico,	42	Duplex and Quadruple Telegraphy,	291
An Important Decision regarding the Construc-		The Panama and Payti,	119	DUPLEX RELAYS,	177
tion of Lines on Railroad Property,	231	Cables, South American and West India,	282	Duplex System on Long Submarine Cables,	280
An Important Legal Decision,	243	West India,	5	Duplex Telegraphy,	274
An Unveiled Mystery of Marine Disasters,	26	Callaud Batteries,	198	Duration of the Lightning Flash,	7
Annual Meeting of the T. M. B. Association,	344	Canada and the Telegraphs,	177	Dynamical Theories of Heat,	10
Annual Report of President Orton,	312	Canadian Pacific Telegraph Line,	329	Earnings of the Anglo-American Company,	5
Ann. Report for 1872 of the Belgian Telegraphs,	82	Can Electricity be profitably employed as a		EARTH WIRES ON TELEGRAPH POLES,	227
Holland "	99	source of power,	36	Economic Portable Batteries,	74
Italian, "	115	Cheap Lightning Rods,	266	Economy of the Callaud Battery,	52
North Ger., "	99	Chemical Dynamics,	85	Effect of Condensers on the Brush Discharge,	266
Swedish, "	115	Chronograph, Dr. Marey's,	197	Effect of Lightning on Trees, The	308
Swiss, "	99	Cincinnati Exposition, The	324	Electric Discharges in Air,	36
Ann. Report for 1873 of the Swiss Telegraphs,	147	Circular to the Stockholders,	281	Electric Head Light for Locomotives,	343
Another Postal Telegraph Scheme,	136	Clock Time by Telegraph,	258	Electric Indicator of Vitiated Air,	4
Answers to Correspondents—7, 23, 39, 53, 68, 84, 100,		Coating Cast Iron with Copper,	266	Electric Light,	4
116, 132, 148, 164, 180,		Combustibility of Iron,	325	Electric Machines, On the Comparison of	10
196, 212, 228, 244, 260,		Communication in Railway Trains,	26	Electric Telephone,	215
276, 298, 308, 324, 340,		COMPARISON OF STEARNS' DIFFERENTIAL AND		Electrical Experiments with an Entranced	
356.		BRIDGE DUPLEX SYSTEMS,	65	Spiritualistic Medium,	194

(RECAP)

	Page		Page		Page
Electrical Figures upon Conductors,	181	Editorial—Another Pioneer Gone,	344	Editorial—The Atlantic and Pacific Annual Report,	73
Electrical Marine Signals,	85	Business Arrangements between the Western Union and the American District Companies,	184	The Atlantic Cable of 1866,	232
Electrical Metallurgy,	58	Close of Vol. VII,	376	The Brain and the Telegraph,	25
Electrical Phenomena in Plants,	66	Comments on Mr. De Bree's Communication,	216	The Brazilian Cable Laid,	200
Electrical Phenomenon, Curious	215	Cuba Cable of 1871 Repaired, The	380	The Break in the Cuban Cable,	152
Electricity as a Motive Power,	7	Death of Frederic Coombs,	120	The Canadian Telegraphs Act,	360
Electricity for Toothache,	353	Departure of Mr. Orton for Europe,	104	The Cincinnati Industrial Exposition,	248
Electricity in Commerce,	229	Did the Sea Save the Nation,	232	The Cuba Cable of 1873,	136
Electricity on Railroads—New Application,	311	Duplex and Quadruplex Telegraphy,	296	The Direct United States Cable,	184
Electricity produced in Mechanical Actions,	227	Duplex Telegraphy,	216	The Fire Alarm System,	57
Electro-Deposition of Aluminum,	26	Efficiency of the Service of the Western Union Company,	232	The Gold and Stock Telegraph Company,	24
Electro-Motograph, The	273	Electro-Motors,	216	The Hubbard Scheme,	41
Electro-Plating,	131	Errors in Other Line Checks,	120	The Lease of the Franklin Lines,	360
Electro-Plating with Cobalt,	179	Fallen,	40	The Milk in the Coconut,	56
Electro-Stannus,	242	Fast Systems of Telegraphy,	280	The Missing Report,	104
Electro-Sympathetic Clocks,	163	Foresight,	184	The Need of New Rules,	328
Electro-Telegraph Progress,	262	Government Messages,	248	The New Departure in Automatic Telegraphy,	361
Electro-Torsion,	291	Half Rate Franks,	328	The New York Delivery Service,	41
Electro-Torsion, On	67	Half Rate Messages,	104	The Ohm,	25
Electrotyping with Iron,	36	Has the Art advanced,	88	The Order in relation to Half Rate Business,	56
Electro-Vigil,	263	Hon. Ezra Cornell,	376	The Postmaster-General once more,	40
Electrolytic Pile, Maiche's	179	Hon. Marshall Jewell,	264	The Proposed Electrical Society,	311
Energy of Electricity, On the	259	Increase in Postal Facilities,	248	The Quadruplex,	312
Estimate for the British Post Office Telegraphs for 1874-5,	133	Is it True,	232	The Report of the Postmaster-General,	361
Evaluation of the quantity of Electricity produced by a Battery Element,	67	John Bright's Birmingham Speech,	41	The Secrecy of the Telegraph,	120
Executive Orders—No. 151—Extending force of 1873 Franks to Jan. 31, 1874,	6	Joseph Priestley,	248	The Telegraphers' Mutual Benefit Association,	328
152—Pre-payment of Half Rate Business compulsory	38	Lease of the Pacific and Atlantic Lines,	8	Treatment of Uncollectible Messages,	377
153—Continuing in force of Complimentary Franks of 1873,	38	Lightning,	264	Trying the Spirits,	200
154—Counting extra words in Messages received from other lines,	55	Mistakes in Chirography,	25	Uniforming Messengers,	56
155—Continuing in force of Complimentary Franks of 1873,	70	More Trouble with the Direct Cable,	344	Unnecessary Office Messages,	56
156—Continuing in force of Complimentary Franks of 1873,	102	New Bonds of the W. U. Company,	184	Wanted—A Character,	184
Experiments on the Dissipation of Electricity by Flames,	339	New Feature in Stock Reporting,	88	Facts of Electricity,	180
Experiments on the Electric State of Conductors on the Italian Lines,	119	New Line to Lake Superior,	24	Fire caused by Frictional Electricity,	9
Experiments on Electrical Transmission through Wood,	258	Obtaining Answers to Messages,	104	First Insurance of Ships,	179
Editorial—A Question of Duty,	200	Periodical Nonsense,	8	First known Treatise on Stenography,	147
A Solution of a Curious Question,	297	President Orton and the Postmaster-General,	24	First Patents granted in the United States,	7
A Timely Gift to the Telegraphers' Association,	361	Profanity on the Wires,	136	First Report of the British Association Committee on Dynamical and Electrical Units,	132
An Excursion of Telegraphers,	216	Proper Rendition of Reports,	56	Floating Telegraph Stations,	327
An Item for Consideration,	344	Protection against Lightning,	200	Foreign Telegraphic Items—5, 21, 37, 54, 69, 87, 103, 119, 133, 149, 165, 181, 197, 213, 229, 262, 264, 282, 291, 309, 327, 341, 375.	
Another Mishap to the Direct Cable,	360	Quadruplex Telegraph,	376	Four Good Habits,	41
		Repeating Messages,	200	Freaks of Lightning,	152
		Responsibility upon Collect Messages	328	Freaks of Lightning,	261
		Rotation,	168	Galvanic Batteries, Some New	357
		Signal Service Messages,	8	Galvanic Electricity,	163
		Signal Service Messages,	312	Gas Pressure Alarm,	215
		Strike of American District Messengers,	184	Globe Telegraph and Trust,	229, 245
		Teaching Telegraphy in Public Schools,	41	Good Work,	230
		Telegraphic Convention of Sympathy,	8	Good Work Well Done,	340
		Telegraphic Information for the People,	184	Government and the Telegraphs,	136
		The American Electrical Society,	328	Government Telegraphs of Japan, The	177
		The American Institute Fair,	248	Has the Majority any Rights,	116

	Page		Page		Page
Highest Telegraph Office, The	371	New Instruments exhibited at the April Soirée		Personal—Durant, George F.	329
Hints to Operators,	238	of the Royal Society,	243	Eastabrook, W. N.	118
Hooper's Telegraph Works,	90, 149	New Magneto Mechanical Separator,	355	Powell, Tunis J.	168
How the English Government treats its Female		New Music,	136	Smith, Gerritt	296
Operators,	147	New Office at San Diego, Cal.,	39	Ward, H. H.	8
How to Keep a Situation,	65	New Office at Worcester, Mass.,	23	Peru and Panama to be connected by the	
HUGHES' PRINTING TELEGRAPH, THE	289	New Police and Fire Telegraph Lines in		Electric Wire,	5
HUGHES' PRINTING TELEGRAPH, THE	305	Brooklyn,	378	Phenomena of Induced Currents, The	101
HUGHES' PRINTING TELEGRAPH, THE	321	New Railway Signal,	147	Phenomena of Static Induction,	260
HUGHES' PRINTING TELEGRAPH, THE	337	New Secretary and Treasurer, Gold and Stock		Photography at the Bottom of the Sea,	183
HUGHES' PRINTING TELEGRAPH, THE	353	Telegraph Company,	8	Plan for a New Atlantic Cable,	54
Hydro-Electric Cable, Tommasi's	266	New Thermo-Electric Pile,	234	PNEUMATIC DISPATCH TUBES—THE CIRCUIT	
Idleness,	75	New Values,	55	SYSTEM,	49
Important Experiments,	10	New York Associated Press,	25	Polarization of the Plates of Condensers,	329
Improvements in Military Telegraphy,	371	New Zealand Telegraphy,	372	POLE LIGHTNING ARRESTER AND ROD,	295
Improvements Suggested,	52	Nickel Plating,	117	Population of the Globe,	166
India-rubber, Gutta-percha, and Telegraph		No Place,	52	Population of the United States,	378
Works,	99	Noble Lives lived by Ordinary People,	25	Post Office Telegraphs,	245
Influence of Albumenoid Substances in Elec-		Note on Magnetism,	195	Postal Telegraph,	281
trical Phenomena,	211	Note on Magnetism,	314	Postal Telegraph Scheme, Another	374
Influence of Electricity on Growth of Plants,		Note on the best Dimensions to give to Electro-		Practical Use of Velocipedes,	163
The	98	Magnets,	27	Prizes for Scientific Experiments,	21
Information Wanted,	22, 55, 118, 200, 265, 375	Notice of J. D. Reid concerning Revision of		PROBLEM, ELECTRICAL,	308
In Memoriam,	308	the Rules,	55	Protection of Government Lines, The	215
Instructions to Operators at Way Stations,	217	Notice to Correspondents,	104	Presentations—Adams, E. P.	55
Intellectual Culture,	294	Notices to Managers—8, 40, 88, 136, 152, 248, 264,		King, Susie W.	212
Intermittance of the Voltaic Current,	43	280, 296		Noble, J. A.	346
International Telegraph Conference, The	295	Novel Application of Electricity,	132	Parker, Nettie	311
International Telegraphic Conference,	199	Novel Application of Telegraph Wire,	212	Rich, Edward H.	311
Kiernan vs. Manhattan Quotation Company,	71	Obituary—Barney, D. N.	86	Smith, Gerritt	311
Landing of the New Atlantic Cable,	228	Butts, Isaac	358	President Orton's Semi-Annual Report,	377
Laws of Magnetism of Steel by Currents,	74	Calkins, George H.	86	Quadruplex System of Telegraph,	215
Lease of the Franklin Lines, The	373	Cornell, Ezra	376	Quadruplex Telegraphy,	371
Lease of the Franklin Telegraph Line,	342	Creighton, Edward	344	Quick Telegraphing,	337
Legal Rate of Postage upon the JOURNAL,	104	De La Rive, Prof. A.	21	Rail System of Electric Signaling,	262
Letter from Prest. Orton to the Postmaster-		Glass, Sir Richard A.	38	Railway Signals,	342
General,	2, 19	McManus, Thomas	358	Railway Signaling,	321
Letters from Mr. R. S. Culley,	101	Porter, Samuel	86	Rapidity of Depolarization of Non-Conductors,	98
Lippman's Small Electro-Capillary Motor,	323	Von Jacobi, Moritz Hermann	151	Regular Eating	9
Light Cables,	178	On a New Relationship between Heat and		Relationship between Electricity, Heat, and	
Lightning in the West,	165	Static Electricity,	195	Molecular Forces, The,	167
Magnetic Metals, The	249	On Change of Pitch of Tones, &c.,	181	Remarkable Operation by Electricity,	9
Magnetism,	58	On Magnetic Bundles, &c.,	266	Remarkable Production of Light in grinding	
Magnetization of Glass, The	165	On Magnetism,	260	Hard Stones,	98
Magnets,	375	On Relations which may exist between Thermo-		Report on the Telegraphic System of Great	
Maps by Telegraph,	147	Electric Properties and Crystalline Form,	179	Britain,	307
Marine News Reports,	281	On the Action of Incadescent Substances, &c.,	202	REPORT ON THE TELEGRAPHIC SYSTEM OF	
Meeting of Chicago Telegraphers,	310	On the Change of Elasticity and Length in a		GREAT BRITAIN,	323
Messengers' Parade and Festival,	361	Wire traversed by a Galvanic Current,	117	Researches in Electricity,	183
METHOD OF TESTING INSULATED WIRES FOR A		On the New Contact Theory of the Galvanic		Researches on Electricity produced in Mechan-	
FAULT,	257	Cell,	167	ical Actions,	358
METHODS OF TRANSMITTING TWO MESSAGES		On the Permanent Magnetism of Steel	147	RESISTANCES AND THEIR MEASUREMENT,	81
ALONG A SINGLE LINE IN THE SAME DIREC-		On the Principle of Volta,	167	Resolutions of Respect and Sympathy,	246
TION AT THE SAME TIME,	273	On the Use of Phenic Acid for the Preparation		Resolutions of Sympathy,	21
MEYER'S AUTOGGRAPHIC APPARATUS,	241	of Wood,	250	Sad Fate of a Nevada Inventor,	214
Military Lines, The Arizona	378	Origin of Glass Making,	163	Sanctity of Telegrams,	227
More Bogus Cables,	54	Pacific Ocean Deep Sea Soundings,	119	Science as Known to the Ancients,	357
Mr. Herring and the Telegraphs,	276	Paniconography	23	Scientific Prizes,	311
Mutual Action of Voltaic Currents,	27	Passigraphy,	215	Scientific Telegrams,	36
New Couple for Continuous Currents,	193	Passivity of Iron,	343	Secondary Currents and their Applications,	10
New Electric Light, The	181	Patent Office, The	311	Secular Change of the Magnetic Declination,	339
New Experiments with the Electric Current,	27	Personal—Bossart, Paul W.	150		

	Page		Page		Page
Seizure of the Telegraph Office at Little Rock,	136	Telegraph Co., The Portland and Astoria	295	The Frog Barometer,	130
Shares of the Gold and Stock Telegraph Com- pany,	134	Telegraph Co., The Southern and Atlantic	230	The Future of the United States,	135
Shocking,	228	Telegraph Co., Southern and Atlantic Annual Meeting,	374	The Government Telegraphs and Railways,	9
Signaling in Mines by Electricity,	67	Telegraph Co., The Western and Brazilian	21, 327	The Hubbard Scheme again,	168
Solutions to Mr. Brown's Problem,	356	Telegraph Co., The Western Union— Election of Directors	312	The Invention of Bells,	195
Soundings for Cables,	74	Telegraph Companies, The	373	The Law of Storms,	162
Soundings for the Pacific Cable,	147	Telegraph in Australia, The	327	The Limit of Perpetual Snow,	25
Spiritual Phenomena,	228	Telegraph in Chili, The	309	The Magnetic Equivalent of Heat,	195
Statistics of Government Telegraphs for 1873,	357	Telegraph in China, The	69, 282	The Magnetism of Electro-Magnets,	106
Statistics of Lightning Strokes in Germany,	22	Telegraph in Colombia, The	327	The Magnetization of Steel,	194
Stirring up the Careless,	39	Telegraph in Guatemala, The	265	The Mechanical Equivalent of Heat,	149
Stratifications of Electric Light,	298	Telegraph in Japan, The	169, 282	The Need of New Rules,	356
Stupidities,	57	Telegraph in Russia, The	309	The New Code of Rules—73, 80, 105, 121, 137, 153, 168, 201, 217, 233, 249, 265, 308	
Submarine Cable Enterprises,	245	Telegraph to Ireland, The	309	The New Western Union Office at Baltimore,	149
Suggestions,	7	Telegraph Extension in Brazil,	37	The Proposed Texas Military Line,	88
Sunday Science,	71	Telegraph Instruments on Trains,	339	The Quarterly Dividend,	279
Supplement to the JOURNAL,	72	Telegraph Matters in Central and South America,	340	The Rupture of Magnetic Needles,	115
Survey for the Pacific Cable, The	135	Telegraph Securities,	282	The Science of Man,	67
TABLES TO FACILITATE THE CALCULATION OF STRAINS OF OVERHEAD WIRES,	161	Telegraph Securities in London,	197	The Service,	74, 106, 122, 263
TANGENT GALVANOMETER AND ELECTRICAL MEASUREMENTS, THE	129	Telegraphers' Mutual Benefit Association— Acknowledgment of Receipts—6, 22, 38, 55, 70, 102, 118, 134, 150, 166, 183, 198, 214, 230, 246, 266, 279, 294, 310, 326, 342, 358, 374		The Signal Service Line on the Coast of North Carolina,	119
Tariff Circular—6, 22, 38, 55, 70, 86, 102, 118, 134, 150, 166, 182, 198, 214, 230, 246, 262, 279, 294, 310, 326, 342, 358, 374		Telegraphic Monsters,	117	The Society of Telegraph Engineers,	23
Tariff, Atlantic Cable Business—55, 86, 134, 150, 166, 198, 246, 262, 279, 294, 310, 326, 342, 374		Telegraphic Securities on the London Market,	37, 71	The Survey for the Pacific Cable,	178
Tariff, Cuba Cable Business—55, 86, 118, 294, 358, 374		Telegraphic System in the Island of Cuba, The	246	The Telegraph and the Mails,	57
Taxation of Telegraph Companies, The	378	Telegraphing the Budget,	151	The Telegraphers' Mutual Benefit Association,	265
Telegraph, Anglo-American	69, 340	Telegraphs, The Anglo-American	87	The Telegraphic Event of 1873,	37
Telegraph, Brazilian Submarine	341	Telegraphs in Army Operations,	306	The Texas Military Line,	134
Telegraph, British and North American	103	Telegraphs of the Argentine Republic, The	359	THE THOMSON GALVANOMETER,	225
Telegraph, Central American	213	Telegraphs of Queensland, The	372	The Western Union Dividend,	185
Telegraph, Construction and Maintenance Co. 103, 169		Telegraphs of the Principal Countries of the World, The	373	The Wind puts itself on Record,	258
Telegraph, Cuba Submarine—87, 119, 133, 226, 229		Telegraphy in Public Schools,	90	Thermo-Electric Pile, Clamond's	131
Telegraph, Eastern Extension and China	327	Temperature on the Earth,	90	Time Telegraph of the Reading R. R. Co.,	231
Telegraph, French Atlantic	229	Testing Leaky Lines,	180	To Come and to Go,	68
Telegraph, Great Northern	229	Tests of Insulators,	199	Toothache Cured by Electricity,	265
Telegraph, Indo-European	99, 309	The Attack of Australian Savages on the Barrows Creek Telegraph Station,	178	Train Telegraph Instruments on the Lake Shore Road,	357
Telegraph, Panama and South Pacific	87	The Aurora Borealis of February, 1874,	163	Trajectory of the Electric Spark,	323
Telegraph, River Plate and Brazil	149	The Beauty of Humility,	265	Transfer Service—6, 22, 88, 70, 102, 118, 134, 166, 182, 198, 214, 230, 279, 294, 310, 326, 342.	
Telegraph, Southern and Atlantic— Election of Officers,	22	The British Telegraph Sorrow,	265	Treasurer's Notice—Cable Business,	88
Telegraph, Submarine Co.	103, 229	The Composite Nature of the Electric Dis- charge,	357	Tremendous Cost of Ignorance,	85
Telegraph, Western and Brazilian	149	The Deposition of Metals by the Magneto- Electric Current,	117	True Worth,	25
Telegraph, West India and Panama	5, 181, 341	The Duplex System on Long Submarine Cables,	261	Two Elements of Real Success,	233
Telegraph Co., The American District	169	The Effect of a Galvanic Current on Elasticity, &c., of Wire,	346	UNDERGROUND TELEGRAPHS,	209
Telegraph Co., The American District— Election of Officers	380	The Electric Telegraph at the Gold Coast,	54	Unsettled Telegraphic Claims,	245
Telegraph Co., The Brazilian	213	The English Language,	57	Unsuccessful Termination of the Direct Cable Expedition,	811
Telegraph Co., The Colusa Lake and Mendi- cino	314	THE ENGLISH TELEGRAPHS,	1	Vaporizing Metals by Electricity	263
Telegraph Co., The Dominion	71, 374	THE ENGLISH TELEGRAPHS,	17	Velocity of Nervous Impulses,	66
Telegraph Co., The Gold and Stock Annual Meeting	298	THE ENGLISH TELEGRAPHS,	33	Vienna Academy of Sciences,	23
Telegraph Co., The Great Western	230, 326	THE ENGLISH TELEGRAPHS,	97	Visit of King Kalakaua,	373
Telegraph Co., The Lebanon and Nashville	232	THE ENGLISH TELEGRAPHS,	113	Warner's New Relay,	343
Telegraph Co., The Pacific and Atlantic— Annual Meeting	152	THE ENGLISH TELEGRAPHS,	145	Waste no Time,	18

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THE ENGLISH TELEGRAPHS.

The telegraphs in the United Kingdom, unlike those of other countries in Europe, are attached to and controlled by the Post-Office Department, being under the especial charge of Frank Ives Scudamore, Esq., C.B., second secretary of the Post-office, through whose efforts, mainly, the government was induced to purchase the telegraphs from the private companies which had constructed and operated them previous to 1870.

The British Post-Office Telegraphs embrace 24,686 miles of line, 103,302 miles of wire, and 3,670 offices, in addition to which there are 1,804 railway telegraph offices working in connection with the post-office telegraphs, making in the United Kingdom a total of 5,474 telegraph offices of all kinds.

About 43,000 miles of wire belonging to the post-office telegraphs are maintained by the railway companies along whose roads the wires extend, and who receive as an annual compensation £1 per mile of wire. The remaining 60,000 miles of wire are maintained by the engineering department of the post-office telegraphs.

The mileage of wire maintained by the railroad companies is exclusively on the railways, and is distributed over a comparatively small mileage of poles, being mainly composed of trunk lines having many wires on one set of poles. The mileage maintained by the Engineers' Department of the Post Office Telegraphs is almost entirely on common roads and canals, or over or under the streets of large towns, and is distributed over a larger mileage of poles, as, though many important trunk lines are included in it, it comprises all the small branch lines, which, in many cases, carry only a single wire.

The estimated annual cost of the engineering staff, including the materials to be used in the maintenance of the wires, instruments and batteries for 1873, is £102,613, which, added to the amounts to be paid to the railway companies for maintaining the wires on their roads, makes a total of £145,613. Of this sum, however, only £132,542 is charged to maintenance, the balance being set down to capital account. Heretofore nearly all the expenses of the permanent engineering staff has been charged to capital. For the first fourteen months succeeding the transfer the amount charged to capital for salaries, wages, traveling and sundry expenses of the engineering staff was £177,094, while, during the same time, only £19,678 was charged to working expenses.

It is very difficult, if not impossible, to ascertain what the annual working expenses of the Post-office Telegraphs actually are, because so many items, properly belonging to working expenses, are charged to capital account, and, besides, the estimates always fall short of the amounts finally rendered.

The estimate of the amount required in the year ending 31st March, 1872, to defray the salaries and expenses of the Post Office Telegraphs was £420,000, while the amount of actual expenditures, as allowed on appropriation accounts, was £591,775.

It is quite evident, from the estimates submitted by Mr. Scudamore, that he has hitherto been laboring under a serious misapprehension in regard to the expenses, and also that they have increased out of proportion to the increase in the traffic. The estimate of the amount required in the year ending

present time have far exceeded the receipts. In 1871 Parliament authorized the appropriation of £1,000,000 to cover the excess of expenditures in the telegraph service up to that time, and a recent investigation shows that an additional £800,000 has been expended since, a large proportion of which has been derived from savings bank deposits. The total amount expended on capital account up to the close of the year 1872 was £8,656,516, and unsettled claims existed amounting to over £4,000,000 more.

The experience of the Post-office authorities in the management of the telegraphs during the past three years has served to correct many preconceived opinions in regard to the similarity of the telegraph and postal services, and to show that the traffic of the former, unlike the latter, cannot be largely increased without adding materially to the expenses, and that any marked reduction of the rates must be preceded by a proportional increase of facilities, in order to satisfactorily perform the increased traffic.

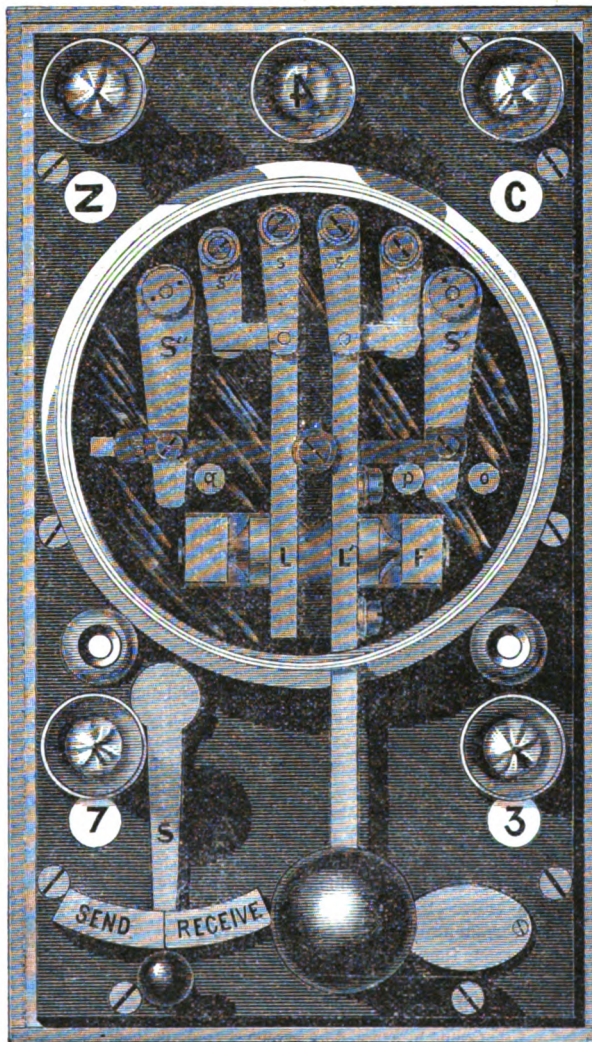
Alluding, in his recent report, to a proposition to reduce the rates to a uniform charge of 6d., Mr. Scudamore says, "that unless the reduction be preceded by the execution of vast additional works, for which time as well as money will be required, the telegraphic business of the country will be thrown into disastrous confusion."

The Post-Office Telegraphs have in operation, upon their lines, seven different kinds of apparatus, viz : Morse's Ink Writer and Sounder ; Wheatstone's Single Needle, Automatic, and A, B, C ; Hughes' Type Printing and Bright's Bell. Of the 8,284 instruments in use, 3,582 are Single Needle ; 2,367 Wheatstone's A, B, C ; 1,509 Morse Ink Writers ; 884 Bright's Bell ; 211 Morse Sounders ; 23 Hughes' Type Printing and 98 Wheatstone's Automatic. Both single and double current Morse keys are also employed.

The single current key is similar to the key in general use upon the lines in this country, the only marked distinction being in its having a contact at the back, through which the line wire is put to earth when the key is raised.

The double current key is quite an elaborate and complicated affair, which is used mainly on long circuits, and where there is a considerable mixture of currents due to leakage. This key reverses the current after each signal. The accompanying cut represents a front view of the double current key.

The line wire is attached to binding-post 3 ; the ground wire, and one side of a polarized relay to 7, the other side of the relay being connected to 4. The positive pole of the battery is connected with the binding-post C, and the negative pole with Z. LL' are two levers, insulated from each other, and moving upon the same fulcrum by pressing upon the knob attached to L. "s s'" are two insulated



31st March, 1872, to defray the salaries and expenses of the Post Office Telegraph service was £669,990, being an increase over the previous year of £249,990, or about 60 per cent., while the increase in the number of messages was only about 15 per cent. Up to July 9th the amount actually expended for working expenses for the year ended March 31, 1873, had not been ascertained.

Whatever the annual working expenses may prove to be, however, when the capital account is closed, it is certain that the expenses up to the

springs connected with *Z*, and *s' s''* are two similar springs connected with *U*. When the knob of the key is depressed a positive current is transmitted through the spring *s'* along the lever *L'* to button *o*, thence by switch *S'* to screw-post 3 to line; and a negative current is sent through spring *s* along the lever *L* to button *q*, thence by switch *S''* to screw-post 7 to earth and one side of the relay, the other side of the relay being connected with screw-post 4 and button *p*, which is disconnected when the switch *S* is turned to send.

When the knob of the key is not depressed the levers *L* and *L'* rest upon springs *s''* and *s'''*. A negative current passes from spring *s'''* to lever *L'*, and thence to button *o* and switch *S'* to screw post 3 to line, and a positive current passes from spring *s''* to lever *L*, button *q*, switch *S''*, and screw post 7 to earth. Thus the line is always charged either with a positive or negative current, whether the key is raised or depressed. When the switch is turned to receive, the battery is disconnected. The current from the line enters at screw post 3, passes to switch *S'*, button *p*, screw post 4, and thence to the relay and ground. When the switch is turned to send, the line wire is disconnected from the receiving apparatus, and the receiving operator cannot stop the sender until the switch is turned from send to receive. Sometimes a tell-tale galvanometer is used, wound with two separate wires, one of them in the sending and the other in the receiving circuit. In sending the receiving coil is switched out of circuit, but the sending coil is affected by both out-going and in-coming signals, and the breaks of the receiving station are readily felt.

The Morse ink writer is regarded as a great improvement on the embossing instrument. The writing is done by a small thin disc attached to the armature lever, and is moved by clock-work in a direction opposite to that of the paper riband. The disc dips into a reservoir of ink consisting of printer's ink diluted with olive oil. The paper used on the ink writers is slightly colored, and is cut in strips half an inch in width. About ten thousand miles of this paper is used every month by the Post-Office Telegraphs. The reading from the paper strips conveys to the mind of a telegraphist accustomed to the use of the sounder, an idea of great backwardness in the art of telegraphy. Some of the operators read from the paper strips and copy with considerable facility however, but on the other hand many of the operators read and copy slowly, and in practice one good sound operator will do as much work as two operators who read from paper. Some of the operators upon the Bright's Bells are very expert, and read by sound as rapidly as the sound operators in America. The bell instrument was introduced as a substitute for Wheatstone's single needle instrument. It contains two bells, or plates of metal upon which the armature lever strikes, for the sound must be dead, not ringing. Each instrument has two electro-magnets worked by its own relay—one by a positive and the other by a negative current. The key employed is the same as that used upon the single needle instrument. The bell apparatus is more expensive and complicated than the sounder, and is going out of use.

(To be continued.)

ELECTRIC INDICATOR OF VITIATED AIR.—A solution of palladium chloride is so connected with a battery that, as long as no metal is precipitated, no current passes; but as soon as carbon monoxide occurs in the atmosphere, metallic palladium is precipitated, which establishes a current, and rings a bell to give warning of the presence of the noxious gas.—*La Gaceta Industrial*.

THE POSTAL TELEGRAPH.

PRIVATE MANAGEMENT BETTER THAN PUBLIC.

A LETTER FROM PRESIDENT ORTON TO THE POSTMASTER-GENERAL, REVIEWING THE RECOMMENDATIONS OF HIS ANNUAL REPORT.

EXECUTIVE OFFICE,
WESTERN UNION TELEGRAPH COMPANY,
NEW YORK, Dec. 6, 1873.

The Hon. JOHN A. J. CRESWELL, Postmaster-General.

SIR: I have before me an official copy of the report of the Postmaster-General for the fiscal year ending June 30, 1873, which contains statements concerning the policy and management of the Western Union Telegraph Company, including allusions to myself, which are so erroneous, unjust and personal, that it seems incredible that they should have been made by a Cabinet Minister in an official communication to the President for transmission to the Congress of the United States.

That it is an unusual proceeding for a private citizen to publicly address a communication to a Cabinet Minister upon the subject of an official report is admitted. On the other hand, I believe it is equally unprecedented for a Cabinet officer, in a public report to the President, to select for official animadversion a business lawfully prosecuted, or a citizen who has infringed no law; and therefore, if any justification is needed, it will be found in the extraordinary character of the paper to which this is a reply. It seems due to the owners of property whose value may be impaired by official misrepresentation, to the public who are largely interested in the proper conduct of the telegraph business, and also to the managers of a corporation who have been held up to public reprobation by the head of one of the most important Executive Departments of the Government, that his errors should be plainly pointed out, and the facts fully and fairly stated.

Before proceeding to do this it seems proper to give a concise statement of the action of the Government toward the telegraph, from the establishment of the latter to the present time.

The system of electric telegraph, which is now almost universally used throughout the world, was first established in the United States nearly 30 years ago. Its inventor and founder was a citizen of the United States, and the first public attempt to demonstrate its utility was upon a line constructed by Prof. Morse and Ezra Cornell, between the cities of Washington and Baltimore. To enable this experiment to be made Congress appropriated, with much reluctance, the sum of \$30,000. Many of those who voted for this appropriation were influenced more by the importunities of the inventor and his friends than by their convictions that the experiment would justify their action. Not a few treated the subject with ridicule, and some proposed, and compelled formal consideration of the proposition, that a part of the appropriation should be expended in Mesmeric experiments, and one facetious member moved to include Millerism also. About the same time an offer was made to the Government by Prof. Morse to sell his patents, and all the benefits to be derived therefrom, for \$100,000. But the offer was not accepted—indeed it was scarcely entertained—and the experimental line, after accomplishing all that Morse claimed or expected, was abandoned by the Government upon the recommendation of the Hon. Cave Johnson, then Postmaster-General, who said in his report upon the subject:

"That the operation of the telegraph between Washington and Baltimore had not satisfied him that under any rate of postage that could be adopted its revenues could be made equal to its expenditures."

This is a brief and simple history of the first attempt to induce our Government to lend its aid to establish, extend, and develop the business which it is now proposed either to wrest from its owners for a nominal consideration, or destroy in value by Governmental competition.

During the 22 years from 1844 to 1866, the only action solicited from or taken by Congress relating to the telegraph was to grant permission to build and maintain lines across the public domain, in order to establish connection with the Pacific coast and intermediate stations. One of these bills authorized the Secretary of the Treas-

ury to encourage the building of such a line by contracting in advance to pay \$40,000 a year for 10 years after its completion for the unrestricted use of said line by the Government. This was, in effect, merely a pledge that Government business for 10 years should amount to the sum of \$40,000 annually. No provision was made for the payment of any excess above that sum, and no excess was ever paid for. It was a condition of this contract that the charge to the public for messages between the Missouri River and the Pacific Ocean should be restricted to \$3. If all the business sent for the Government on that line had been paid for at that rate, it is believed that the companies would have received a much larger sum than that named in the contract. In this connection it seems proper to call attention to the striking contrast between the indifference which our Government has manifested toward the telegraph and the liberal aid and encouragement which it has extended to the railroads.

WHAT THE GOVERNMENT HAS DONE FOR RAILROADS.

In the Report of the Secretary of the Interior for the last fiscal year the following railroad companies are represented to be indebted to the United States for bonds issued to aid in their construction in the amounts set opposite to each:

Union Pacific.....	\$27,236,512
Central Pacific.....	27,865,680
Central Branch.....	1,600,000
Kansas Pacific.....	6,303,000
Sioux City and Pacific.....	1,623,320

Total.....\$64,623,512

The value of the public lands granted to the companies above named, and others to which bonds were not issued, is probably many times the amount above stated. Hundreds of millions of Government aid to railroads, and but thirty thousand to the telegraph!

CONGRESS AND THE TELEGRAPH.

At the session of Congress in 1866 a bill was introduced in the Senate to incorporate and confer special privileges upon the National Telegraph Company. This bill did not pass, but, pending its consideration, the Senate adopted a resolution requesting the Postmaster-General, the Hon. William Dennison, to consider and report upon the expediency of uniting the postal and telegraph systems. This report concludes with the following:

"As the result of that investigation under the resolution of the Senate, I am of the opinion that it will not be wise for the Government to inaugurate the proposed system of telegraph as a part of the postal service, not only because of its doubtful financial success, but also its questionable feasibility under our political system."

The discussion of the subject at that session resulted in the passage of a general law, which authorized telegraph companies duly incorporated under the laws of the several States to construct and operate lines in all the States and Territories, upon any military or post roads, and to cross navigable waters. The right of telegraph companies to enjoy these privileges was conditioned upon their assenting to the provisions of the bill, among which were the following:

1. That the Postmaster-General should fix annually the rates for Government messages, which messages should have priority over all others.

2. That the United States, at any time after the expiration of five years from the passage of the act, might purchase all the telegraph lines, property, and effects of any or all of said companies at an appraised value, to be ascertained by five competent disinterested persons—two to be selected by the Postmaster-General, two by the companies interested, and one by the four so previously selected. All of the principal telegraph companies in the United States have filed their acceptance of the terms of this act, and are therefore entitled to enjoy its benefits.

After due consideration of the project of a postal telegraph, the passage of such an act by Congress, as a substitute for a bill proposing to confer special privileges upon a corporation which they were asked to create, and the subsequent acceptance of its terms by the companies then engaged in carrying on the business, was understood by the latter as indicating the adoption of a fixed policy by Congress, and as constituting a compact between the Government and the companies, equally binding in honor upon both parties as if made between individuals and executed under seal.

The contrast between the treatment by Congress of the telegraph and other interests is also noticeable in the terms of this bill. The privileges which it confers upon the telegraph cost the Government nothing; and yet they were conditioned upon the concession by the telegraph, first, of the right of a Government official to fix the rate of charges on Government messages, and the requirement that such messages should have priority over all other business, regardless of the loss and damage which

the companies might suffer thereby; and, second, that the Government should have the right to purchase the property of the telegraph companies, and to prohibit them thereafter from carrying on the business, although the compensation to be offered might not be satisfactory to the owners. On the other hand, with but few and unimportant exceptions, the grants made by the Government to railroad companies were without restrictions, while the right to cross the public lands with the telegraph line to the Pacific coast was granted upon the condition that \$3 should be the maximum charge for a message thereon. The highest charges in the United States for railroad fares and freights are now made by those companies which Congress has aided in an amount nearly or quite equal to the actual cost of their construction. These charges have not been materially reduced in several years, while the present telegraph rates are now only about one-half those charged six years ago.

During the third session of the XLth Congress, three bills relating to the telegraph were presented to the House, and by it referred to the Committee on Post-Offices and Post Roads.

The first, offered by Mr. Washburne of Illinois, provided for the construction by the Government of a line between Washington, Baltimore, Philadelphia and New York, to be connected with the post-offices in those cities and with such intermediate stations as might be designated by the Postmaster-General. The rate fixed by the bill was 15 cents for a message of 10 words, exclusive of date, address, and signature, but including delivery.

The second was a bill in favor of the scheme which has been advocated for several years by Mr. Hubbard, the details of which it is unnecessary to state in this connection.

The third provided for the construction of a line between Boston, Washington, and intermediate cities, by the parties named therein, under the direction of the Postmaster-General. This bill was similar in principle, although differing materially in details, to that proposing to incorporate the National Telegraph Company herein before referred to.

The Committee having these bills in charge held numerous sessions, at which parties who favored their passage, and those opposed thereto, were afforded ample opportunity to discuss their merits. After full consideration they decided unanimously to report against their passage. The opinions of the Committee, as set forth in this report (No. 32, XLth Congress, Third Session), appear to have been accepted by the House to which it was presented, since no further action was taken on that subject during the session.

The following extracts from the report are especially applicable to the present case. Referring to the law of 1866, the Committee say:

"Is there not, in view of the relations thus voluntarily established, a solemn compact between the Government and these corporations, which would be violated by any legislation tending to deprecate the value of their property before the right to take it at a valuation accrues.

"Would any of these companies have accepted the terms of the act, and bound itself by its obligations on any other understanding than that the Government, with whom it contracted, should do nothing to violate the spirit of the compact so long as the obligations of it continued. There is not within the knowledge of the Committee any precedent to justify the Government in entering into competition with its own citizens, exercising franchises secured to them by legislative authority, and to the injury of private property, without providing a just measure of compensation.

"Two systems of telegraphs—one public and one private—cannot operate side by side with success to either or with benefit to the public. The functions of the Government are necessarily exclusive, and whenever it formally undertakes any service, as proper to be exercised by it, private parties must be excluded from the performance of the same service."

At the second session of the XLth Congress Mr. C. C. Washburn of Wisconsin introduced a bill in the House which provided for the purchase of all the telegraph lines in the country at their appraised value, substantially as provided by the act of 1866. This bill was referred to a Select Committee, of which its author was made Chairman; and the bill known as the Hubbard bill, which had been presented again at that session, was referred to the same Committee. This Committee, which was composed of some of the ablest members of the House, gave much time to the consideration of the subject, and to hearing parties who appeared both for and against the bills. And although they permitted a report by the Chairman in favor of the bill introduced by him, and another in favor of the bill of Mr. Hubbard, to be presented to the House, so as to enable them to be printed together with the proceedings before the Committee, both reports were recommitted, and no further action thereon was taken either by the Committee or by the House at that session.

At the same session the Hubbard bill was introduced in the Senate, and referred to the Standing Committee on Post-Offices and Post Roads. That Committee, although they had given the opponents of the bill but one opportunity to be heard upon it, and that limited to about fifteen minutes, subsequently reported it favorably to the Senate. After a brief discussion there its further consideration was indefinitely postponed.

The preceding statements contain all that is material concerning the action of Congress in respect to the telegraph, and to proposals for connecting it with the postal service, from the appropriation of \$30,000 to enable the first experiment to be made, down to the last session. In December, 1872, so much of the annual report of the Postmaster-General for the fiscal year ending June 30, 1872, as related to the telegraph, was referred by the House to the Standing Committee on Appropriations.

In that report the subject was discussed at considerable length, although with great unfairness to the telegraph companies. The Postmaster-General recommended that the lines of some or all of the companies should be purchased under the provisions of the act of July 24, 1866, and placed under control of the Post-Office Department.

Concerning the project for the incorporation of the Postal Telegraph Company, known as the Hubbard scheme, the Postmaster-General says:

"I am decidedly of opinion that if the people interested require a postal telegraph, it should be entirely in the hands of the Government. If, on the contrary, a postal telegraph is not so demanded, then the Government should not favor one private company to the exclusion of another, nor should it in anywise enter into competition with private enterprise."

The Committee on Appropriations held a special evening session for the consideration of the recommendations made in this report, which was attended by representatives from all the principal telegraph companies in the country, and also by the Postmaster-General and other Government officials. The statements contained in the report were thoroughly discussed and its recommendations fully considered. It is not unfair to say that the facts and arguments submitted by the representatives of the telegraph companies completely refuted the most important statements made by the Postmaster-General, and on which his conclusions and recommendations were based. It is not surprising, therefore, that no further action on the subject, either by the Committee or by the House, was taken at that session.

REPORT OF THE POSTMASTER-GENERAL FOR 1873.

I propose now to consider the report of the Postmaster-General for the last fiscal year. This document differs in several particulars from every other official paper on this subject. Although in the discussion upon the first appropriation the proposals to establish the telegraph, as a means of communication between distant stations, was spoken of by some in terms of derision, and although it was deemed for many years—if not unworthy of Congressional notice—as having small claim to Congressional favor, it has not been publicly assailed in an official document by any other prominent officer of the Government, nor has its property been depreciated, its policy and management disparaged, or its officers invidiously mentioned by name.

The Postmaster-General has by law no jurisdiction over the telegraph, except to fix the rates annually for Government messages. The present incumbent of that office has never been requested by Congress to give them any information or opinions on the subject; yet, in view of the fact that the Government has secured the right to purchase all the telegraph lines in the country, no objection can be made to the discussion by him of the question of connecting the telegraph with the postal service. I submit, however, that in any such discussion concerning private property and persons, the former is entitled to be treated with common justice and the latter with common civility.

The report of the Postmaster-General, now before me, in the portion which treats of the telegraph, begins with a reference to certain statements made in his report of the preceding year. These statements contained estimates of the original cost, and also the cost of duplicating all the telegraph lines and apparatus in use in the United States. The present report then proceeds:

"There is no need of repeating those reasons or estimates. I desire, however, to express my full confidence in the soundness of the former and the approximate correctness of the latter, notwithstanding the efforts which have been made to invalidate them."

THE POSTMASTER-GENERAL ESTIMATES THE VALUE OF ALL THE TELEGRAPH PROPERTY IN THE COUNTRY AT \$11,880,000.

The estimates referred to in this extract, and concerning the soundness of which "full confidence" is now expressed, were these: First, that the entire cost of all the lines in the country, including patents, was much less than \$10,000,000; and, second, that the cost of a new system, equal in extent to the present, would be \$11,880,000.

There are no data accessible which shows, even approximately, what has been expended in the extension of telegraph lines during the last thirty years; but at the time these statements were made the property of telegraph companies was worth, in the market, not less than \$50,000,000. The only witness whose estimate was appended to the report expressed the opinion that the existing lines could be duplicated for about \$18,250,000, provided the wire could be imported free of duty. But, as the Government has required the companies to pay duty, either directly to the Treasury on what they have imported, or indirectly on what they have purchased at home, it will hardly be deemed reasonable to leave this item out of the account. Adding it to the estimate of the witness, the total would be over \$20,000,000.

A SOLITARY WITNESS.

It appears, then, that the solitary witness called by the Postmaster-General to testify as to the costs of duplicating the present system named an amount 100 per cent. greater than that stated in the report. The witness had never constructed but one telegraph line, and that was for the use of the fire department of a large city. For that line of 80 miles of poles and 625 miles of wire he charged and was paid \$850,000. Comparing this charge

with his estimate made for the Postmaster-General, in proportion to the number of miles of wire used, the telegraph lines in the United States would cost more than \$200,000,000. But on the basis of the number of miles of poles, the cost would be nearly \$800,000,000.

OFFICIAL DEPRECIATION OF PROPERTY WHICH THE GOVERNMENT HAS INDUCED THE OWNERS TO AGREE TO SELL.

In the face of these facts, "clearly established before the Committee on Appropriations only a year ago, the Postmaster-General, who is not presumed to have any practical knowledge of the subject, now expresses "full confidence" in the correctness of estimates which were not then, and have not been since, sustained by a particle of evidence. It would seem for other reasons than those of the Postmaster-General, that "there is no need of repeating those estimates."

The Government has the right to buy the property of the company thus assailed, and the utterance of official opinions calculated to prejudice the public mind as to its value, looks like an attempt to forestall the award of the arbitrators, and to compel the owners to accept a sum less than that to which they consider themselves entitled, rather than take the risk of inciting greater official hostility. The injustice of such a proceeding will be apparent to any one who examines the facts.

The report proceeds as follows:

UNFOUNDED CHARGES.

"One fact is conspicuous and most significant, and that is that the opposition to the postal telegraph comes almost entirely from the telegraph companies and those directly interested with them in sustaining their monopoly."

"Every intelligent disinterested observer, who has seen the working of the Government systems abroad, gives them the decided preference."

These statements are unjust both to the telegraph companies and to the public. The opposition made by the companies to the various postal telegraph schemes, has been mainly confined to the refutation of mis-statements concerning the value of their property and the comparative cost of carrying on the business in this and other countries. The press are almost unanimously opposed to it, and there is no evidence that even a respectable minority of the people desire its assumption by the Government.

The report further proceeds to say:

"Under the present management, the use of the telegraph by the masses of the people is almost prohibited by reason of arbitrary rates, unnecessarily high charges, and a want of facilities."

After referring to a statement made by the President of the Western Union Company before the House Committee on Appropriations last Winter, the report proceeds:

"It may, however, be regarded as settled, that while under the control of private companies, whose chief object is to make a profit for their stockholders, and whose skill and labor are expended in efforts to advance the price of their stock, and to enforce the highest rates to which the people can be made to submit, the telegraph will never become a general medium of correspondence."

COMPARATIVE USE OF THE TELEGRAPH IN THE UNITED STATES AND EUROPE.

The people of the United States use the telegraph as freely as those of other countries. They are now sending messages at the rate of more than 20,000,000 per annum, the Western Union Company alone having sent about 1,500,000 in the month of September last, not including a press service greater in the aggregate than that performed in the same time by all the other telegraphs in the world. It appears by the tables appended to the report of the Postmaster-General that in 1872 Great Britain sent 16,500,000 messages; France in 1871, 5,200,000; Spain in 1872, 1,100,000; Belgium in 1872, 1,900,000; Austria in 1871, 3,000,000; Germany in 1872, 8,200,000; Italy in 1871, 2,600,000; Russia in 1872, 2,800,000; Switzerland in 1872, 1,750,000.

The tables also show that 44,337,702 interior messages were sent for 65,191,306 francs—being an average of about one and a half francs per message. But that for 6,274,637 international messages—that is, messages sent from one country to another—the receipts were 27,851,903 francs—being an average of nearly four and a half francs per message.

CHARGE OF ARBITRARY RATES REFUTED.

What is meant by "arbitrary rates" it is not easy to understand. The right of the companies to fix the rates except for Government messages cannot be questioned. The present tariff system is based on air-line distances between all stations, regardless of the actual distances over which messages are necessarily sent; and the rate for like distances is the same in the eastern, northern, western, and southern sections. There are a few rates, most of them on or near the direct route between Boston and Washington, that are below the scale rate in other sections. As to these rates being "high charges," the fact can be established that they are relatively as cheap as the average rates of other countries, if not absolutely cheaper. The Western Union Company has had in operation for nearly four years a system of night messages at half rates, which provides a cheaper telegraph service for like average distances than exists in any other country. These messages may be filed at any time during

the day and are deliverable the next morning. Under this arrangement messages are sent from New York to Buffalo and Pittsburgh for 25 cents; to Cleveland for 38 cents; to Chicago and Cincinnati for 50 cents; to St. Louis for 75 cents; New Orleans and Mobile for \$1, and to all parts of Texas for \$1 25. The extent to which rates have been reduced in the United States within the last five years will be comprehended by comparing the above rates with the following, which were the rates charged before that time. New York to Buffalo and Pittsburgh, 75 cents; Chicago, Milwaukee, and St. Louis, \$2 10 and \$2 25; New Orleans and Mobile, \$3 25; Galveston and other points in Texas, \$4 and \$4 50; San Francisco and other places in California, \$7 and \$7 50; Oregon and Washington Territory, \$9. The half rate for night messages has not been applied to stations on the Pacific coast; but, instead, \$2 50 has been fixed as the maximum rate between any two stations on the Western Union lines. These reductions are greater than those made in any other country during the same time.

In every European country, except Great Britain, the message comprises twenty words, all words being counted. In this country ten body words constitute a message—the date, address, and signature being free—and the average of the free words to each message is considerably more than ten. The present average tariff in the United States is 50 cents for a message of ten words, with date, address, and signature free! The purchasing power of 50 cents of our paper currency is scarcely greater than that of 1½ francs on the continent of Europe, and but little greater than that of the English shilling.

This is especially true when applied to labor, which is the chief item of expense in the telegraph business, not only in the United States, but in all other countries. In nearly every European country it will be seen that the tariff for interior messages is less than half the average rate on international messages.

LOSSES FROM OPERATING THE TELEGRAPH IN OTHER COUNTRIES.

It further appears, by the tables appended to the Postmaster-General's report, that in 1872 the product of interior messages in Germany was 6,521,869 francs, and that there were disbursed for salaries 8,391,745 francs; yet, by omitting from the exhibit all expenditures for construction, Germany was enabled to show a profit of about 200,000 francs, derived from 1,500,000 international messages, which yielded over 5,000,000 francs.

France has a population nearly equal to that of the United States, and a very extensive and complete telegraph system. There were sent, in that country, in 1871, 4,371,962 interior messages, the product of which was 4,494,823 francs. There were expended for salaries in the same time, 9,620,000 francs; and the total loss from operating the telegraph that year was 4,135,674 francs. Yet nearly one half of the French telegraph receipts for that year were derived from international and transit messages, but for which the loss would have been over 8,000,000 francs. In view of these results, it will not be deemed surprising that early in 1872 the French telegraph authorities advanced the rates 20 per cent on one class of messages, and 40 per cent on another. The larger increase applied to the rates which yielded over 60 per cent of the revenue of the previous year.

The result in Spain, in 1872, is still worse. The gross receipts are set down at 1,774,414 francs, and the expenses for salaries and maintenance 3,489,380 francs, of which about 3,000,000 were paid for salaries.

In neither of these countries did the gross receipts from interior messages amount to half the sum expended for salaries.

The telegraphic expenses of Austria in 1871 were about 800,000 francs in excess of receipts; Hungary, in 1872, 1,750,000 francs; Belgium, 100,000 francs; Portugal, 500,000 francs; The Netherlands, 600,000 francs; Sweden, 700,000 francs.

Russia shows a profit of over 4,000,000 francs, and appears by the tables to have received nearly 14,000,000 francs from 2,500,000 interior messages—being an average of about 5½ francs per message. Her receipts from 500,000 international messages were about 3,000,000 francs, being at the rate of nearly 6 francs each. In territorial extent, and the distribution of population, Russia compares with the United States more nearly than any other European country. It will be seen from these statements that the average charge for messages in that country is much greater than in the United States.

THE RESULT IN GREAT BRITAIN.

In the statistical tables appended to the Postmaster-General's report, the operation of the telegraph in Great Britain for the year 1872 exhibits an apparent profit of 2,600,000 francs. I say an apparent profit, because in the reports of the telegraphic operations in that country a large amount is carried annually to capital account, for disbursements, which in other countries are charged to maintenance. The evidence is conclusive that the revenues from the British telegraphs, since the lines were taken over by the Government, have every year fallen considerably short of the actual working expenses. During the last year the expenditures on account of the telegraph have been made the subject of special Parliamentary investigation, which resulted in disclosing the fact that, besides applying all the receipts from the busi-

ness, and a large appropriation by Parliament, there had been drawn from the deposits in the postal savings banks, and expended upon the telegraph, over £800,000. These disclosures were followed by the resignation of the British Postmaster-General, Mr. Monsell. During the investigation, which was conducted by a Parliamentary Committee, inquiries were addressed to Frank Ives Scudamore, Esq., the Manager of the Post-Office Telegraphs, as to the application of the appropriations and the postal savings bank funds, and the results which he expected from their investment. In his reply, made in July last, in which the receipts and expenses for two years are estimated, he states that at the close of the next fiscal year, ending March 31, 1875, it is his opinion that the capital stock will stand debited with over £10,000,000, and that he will then have paid interest on the capital, from the average date of its investment, at the rate of three per cent. per annum. The British telegraph system is more extensive and more efficiently worked than any other Government telegraph in Europe. But when the estimated £10,000,000 have been invested in it, it will not be equal in extent to that of the Western Union Company at the present time.

A STRIKING CONTRAST.

Contrast £10,000,000—equal to \$50,000,000 gold—with the Postmaster-General's estimate that the lines and property of the Western Union, and all other companies in the United States, can be reproduced for \$11,880,000!

Concerning the estimates of Mr. Scudamore I venture to remark that the net profits of the business at the date he fixes will not enable the payment of three per cent. or even one per cent. upon the capital invested. Not that his efforts will in the meantime be relaxed, nor that anything will be omitted which would tend to increase the efficiency, or promote the economy of the service under his charge, but because, after three years' experience, in which all his original estimates have fallen far short of reality, he still underestimates the amount of his inevitable expenses, and overestimates the profits possible to be realized. In view of the fact, then, that the average tariff on interior messages in Europe is 1½ francs, and on international messages 4½ francs, it will be seen that the rates in this country, which the Postmaster-General denounces as "high charges," are, taken altogether, as low as the average rates in European countries where the telegraph is under Government control.

THE TELEGRAPH NOT A BENEVOLENT INSTITUTION.

It is strictly true that the chief object of the companies is to make profit for their stockholders. It is for that purpose alone that private parties have invested capital in the telegraph business; and there is no good reason why the investors in such property, and those to whom they have intrusted its management, should be subjected to the invidious rhetoric of a Cabinet officer, more than citizens engaged in other legitimate industries; neither should their efforts to make the business remunerative and the property valuable, by lawful means, be made the subject of official condemnation. The present telegraphic facilities are adequate to meet all the demands upon them. In no other country have telegraphic facilities increased so largely, during the last few years, as in the United States. This increase has not only kept pace with the public demand, but in many sections has anticipated it. While in other countries the cost of telegraphic extension, and in some of them a part of the cost of its operation, has been paid from the public treasury with moneys raised by taxation upon the people, in the United States the extensions have been made entirely by private capital, furnished by private citizens.

THE "FAST SYSTEM" SLOWER THAN THE MORSE.

The next notable statement in the report relates to what is therein styled the "Automatic or Fast System."* It is certainly an unusual instance of good fortune when the owners of patents, who have been for years unsuccessful in their efforts to make a satisfactory sale, are enabled to secure so valuable an advertising medium as the Annual Report of a Postmaster-General. The inference to be drawn from the statements in the report concerning this wonderful "system" is that it is a budding novelty, just ready to burst into the full bloom of triumphant success. I would not blast its promise by even the breath of an unkind word. But a few plain and simple truths concerning it must be told.

First: It is not a novelty. There lies beside me, as I write, a pamphlet bearing date Dec. 1, 1869, throughout whose 22 pages the praises of what it had then achieved are glowingly set forth.

Second: It is not a success. Four years of constant trial, during which large sums have been expended in practical experiments, and in endeavoring, by new devices, to overcome constantly developed defects, have

* Appendix B.

failed to demonstrate its superiority over existing modes, or even its ability to compete successfully with them.

Automatic telegraphy, as a separate system, has never been attempted in any country. It has been in use in England for several years, but only as an aid to the Morse system, or as a substitute for others greatly inferior to the Morse, and which either were never introduced into this country or were long since discarded. Its chief defects are: 1. More time is required to prepare a message for transmission by the automatic than to send it by the Morse. By the latter the receiving operator writes out the message as fast as the sending operator transmits it, so that when the sending is finished the copying is completed, and the message ready for delivery.

2. By the automatic system the message is received in the dots and dashes of the Morse alphabet. More time is then required to translate and copy than is occupied in both sending and copying in the ordinary way. No matter, then, what the rate of speed at which the signals are made to pass over the wire—if it takes as much time to prepare for transmission, and again as much time to translate and copy after the message is received as to transmit and copy by the Morse system—it is plain that twice as much time is consumed in respect to any single message by the automatic process as by the ordinary Morse.

But there are other grave practical difficulties. The automatic apparatus, as compared with the Morse, is cumbersome, intricate, and costly. It gets out of repair easily, and the cost of providing duplicates for use in case of accident, and of shipments over long distances for repairs, constitute a serious objection.

Again, it is evident that in the separate processes of perforating, transmitting, translating and copying by the automatic system, more operatives are required than in the regular Morse. The testimony of those connected with the Government telegraph in England is that it takes five times as many operators to successfully work the former process as the latter. The cost of operating is the chief expense of carrying on the telegraph business. It would be much cheaper to provide additional wires, and to apply the duplex to them than to double the cost of operating, but if it be necessary to multiply this cost by five, that fact alone constitutes a fatal objection.

DOUBLE TRANSMISSION ON ONE WIRE THE FASTEST SYSTEM KNOWN.

The duplex apparatus, the patents for which are owned by the Western Union Company, is capable of rendering much more valuable service than the automatic, even if the graver defects of the latter are successfully overcome. The duplex works equally well single or double, thus obviating the necessity for duplicating instruments. It doubles the capacity of a wire by enabling messages to be transmitted over it in opposite directions at the same time, without any perceptible diminution of speed. It does more than save the cost of providing and keeping in repair additional wires. It gives the carrying capacity of two wires when, by accidental interruptions, there is but one in working order, and when no amount of money previously invested in wires would have provided another.

Concerning the autographic systems of Meyer and others, it is sufficient to say that they are merely electrical toys, which excite interest by their results without serving any useful purpose. Their operations are too slow, the apparatus too expensive, and the occasions for its use too limited to give them any value as parts of a practical system.

(To be continued.)

ELECTRIC LIGHT.

A company in Paris are now making an improved electrical machine for producing the electric light. It is provided with four plates, and when made to revolve 350 times per minute affords a light equal to 230 or 300 gas burners. A steam engine of 24-horse power serves to run the machine, which costs the nice little sum of 8,000 fr. (\$1,600 gold). This is not so very expensive, when we remember that a few pounds of charcoal will produce as brilliant an effect as could be had from 20 lbs. of rapeseed oil. The light is well adapted to lighthouses, ships and large halls; and why not for lighting city streets? A few of these scattered about the city would greatly relieve the dangers attendant upon a gas strike.—*Journal of Applied Chemistry.*

AN HONOR TO PROF. HENRY.—Professor Joseph Henry, Secretary of the Smithsonian Institution, has received from the French Government a superb porcelain vase, as a testimonial of his services as the United States representative of the commission on the international standard meter.

FOREIGN TELEGRAPHIC ITEMS

WEST INDIA AND PANAMA TELEGRAPH.

The fifth general meeting of the shareholders was held on Monday, at the Cannon street Hotel, Vice-Admiral Sir John C. D. Hay, Bart, M. P., in the chair.

The report stated that the receipts for the year ended the 30th of September last, amounted to £26,186, and the expenses, including interest, to £25,700, leaving a balance of £486. The directors regretted that the result of the year's working had not been more satisfactory. This was entirely to be attributed to the condition of many of the cables, as reported to the shareholders at the last general meeting. Both the International Ocean Telegraph Company's cables from Key West to Havana were interrupted from the 15th of June, 1872, to the 1st of May, 1873. They had been repaired or replaced. The Jamaica-Porto Rico cable, on which so much depended, ceased working on the 26th of January, and was not repaired until the 7th of August. The Dominica-Martinique cable failed on the 20th of January, and, having worked intermittently till the 2d of September, had since been dumb. The Trinidad-Demerara cable was interrupted from the 20th of February to the 2d of September. The Jamaica-Porto Rico and the Trinidad-Demerara cables were repaired by the Telegraph Construction and Maintenance Company, under arrangements approved at the extraordinary general meeting on the 17th of March last. The estimated cost of those repairs, with sundry other expenses of like origin, had been placed to the debit of a suspense account, as part of this Company's claim against the India-rubber, Gutta Percha and Telegraph Works Company, the directors being advised that the interruptions causing the expenditure had occurred from the imperfect manufacture and laying of the cables. This suspense account would further be debited with repairs or renewals of cables, which might be proved to have failed from non-fulfillment of contract. The subsidies received during the year amounted only to £5,402. The full amount payable by the various Governments, of whose offers of subsidy the Company had as yet been able to avail itself, viz., £16,800, would have been received but for the interruptions mentioned, some of those Governments having withheld their payments during these interruptions. The solicitor of the India-rubber, Gutta Percha, &c., Company informed their solicitor, on the 18th of October, that the Jamaica-Colon cable was completed. The directors had instructed the engineer to report on its condition. Meanwhile, the messages of the public were being conveyed by it. Sir Samuel Canning reported, on October 30, in respect of the Jamaica and Porto Rico section, that Mr. T. Smith had reported that its electrical state was in a most unsatisfactory condition, and that the cables might be expected to break down at any moment. It would be seen from the report of the engineer that the Jamaica-Porto Rico cable was in a most hazardous condition. The vital necessity for the maintenance of that connection, on which all their subsidies, and so much of their traffic, present and future, depended, was so obvious, that the directors had decided to lay the new cable, now made, from Jamaica to Porto Rico, instead of to Colon, as at first intended. This change of route would add nothing to the expense, the distance being nearly the same. The breaking of the Dominica-Martinique cable, and its bad condition, obliged them to send out some additional cable to complete that section. The Telegraph Construction and Maintenance Company had undertaken to

convey this cable out in the same expedition as that which was now about to sail with the new cable for Jamaica-Porto Rico, but the manufacture of the additional cable would entail a delay of three weeks, and thus extend the time for the completion of the contract to the 20th of January, 1874. After referring to the suit in Chancery pending between the Company and the contractors, the directors stated that they had recently been informed of an interruption to the Cuba Submarine Telegraph Company's cable between Batabano and Santiago de Cuba, and that steps had been taken for its repair. The balance-sheet showed that £699,887 had been expended on capital account.

PERU AND PANAMA TO BE CONNECTED BY THE ELECTRIC WIRE.

A correspondent of the New York *Herald* writing from Lima, Peru, under date of Nov. 21, 1873, gives the following information:

On the 13th inst. were opened the bids, or, I should say, the only offer, for the submarine cable from Payta to Panama, made by the Telegraph Maintenance Company, of London, and the document was instantly approved and endorsed by the Minister of Public Works. The Telegraph Maintenance Company refuses the guarantee authorized by Congress on the estimated cost of the work, and merely stipulates for the exclusive privilege of fixing a high tariff for the transmission of messages. But, taking into consideration the risky nature of the enterprise, the contractors are certainly entitled to a generous profit. The cable will be at once prepared, and laid before 18 months have elapsed from the date of the acceptance of the contract.

Peru will now have to use her diplomatic influence with the United States of Colombia and Ecuador to obtain for the builders of the line the monopoly stipulated for. Once that the wire is successfully submerged, the electric communication between Lima and Panama will be complete, the land facilities from this capital to Payta having been extensively employed for four years past. But still greater accommodation will, it is hoped, be soon offered to the general community.

Another monopoly has been requested by another English company, to extend a cable from Pisco to Caldera in Chili, on conditions that it in nowise draw funds from the National Treasury. Then, with the line uniting Lima with Panama and that reaching from the Peruvian metropolis to Pisco, a port to the south, distant about 150 miles, and the land wire from Caldera to Santiago de Chili, Valparaiso and Panama will be placed on speaking terms.

No danger of interruption is anticipated from the quiet waters of the inshore Pacific, and if the Atlantic will only be tranquil our news from Europe and the United States will be received with but a few hours' delay.

THE WEST INDIA CABLES.

Electricians were expected at Kingston, Jamaica, on the 21st ult., in the *Tagus*, from Southampton, to test the electrical resistance of the Aspinwall Cable, prior to the West India and Panama Company taking it, which they are about to do. After testing the Colon Cable, they will wait for the arrival of the Telegraph Maintenance Company's Cable fleet, now on the way to Puerto Rico to lay a second line of cable between that island and Jamaica, in anticipation of a new submarine line contemplated between St. Thomas and Bermuda, with branches to New York and Land's End, England, in connection with the Brazilian series of cable.

EARNINGS OF THE ANGLO-AMERICAN TELEGRAPH COMPANY.—A correspondent writes to the *Railway News* regarding the Anglo-American Telegraph Company. He states that that Company has a reserve fund of £250,000, besides 1,000 miles of new cable worth £300,000, thus making an actual reserve of £550,000. It has three cables at work, and is earning a splendid revenue. Up to September last the receipts were about £2,000 per day. At this time the American financial crisis commenced, and the receipts at once marked £3,000 to £4,000 per day. This financial disturbance has kept the cables well supplied ever since.

A BILL authorizing a loan of £100,000, for the construction of a railway and telegraph from Geraldton to Northampton, and a line of telegraph from Newcastle to Champion Bay, has been passed by the Legislative Council of Western Australia.

MESSRS. GRANT BROTHERS, the London agents of the River Plate and Brazil Telegraph Company, have intimated that the Government of Brazil has extended the period of concession of the cable from 40 years, at which it was originally fixed, to 60 years; also, that the manufacture of the cable is progressing very satisfactorily, and that vessels are now being fitted up for embarking it, so that the completion of the undertaking may be looked for at an early date.

THE list of the Indo-European Telegraph Company, issued on the 20th ult., shows an average time taken in transit, between London and Calcutta, of one hour 21 minutes; Bombay, of one hour 34 minutes; other places in India, of two hours eight minutes.

THE Eastern Telegraph Company's direct cable between Cornwall and Lisbon has been repaired, and is re-opened for traffic. This additional means of communication will greatly expedite the transmission of messages exchanged with Spain and Portugal.

MESSRS. C. DE BERGNE & Co. have recently erected, at the Charlton Works of Messrs. Siemens Brothers, eleven new wrought-iron cable tanks, and have made considerable additions to the height of several previously existing tanks, intended to receive the cores under contract by Messrs. Siemens. The tanks are severally of 34 feet diameter and 42 feet length.

THE Eastern Extension Company's cable between Singapore and Penang is temporarily interrupted. The fault, being close to Singapore, is expected to be speedily repaired.

THE Directors of the Globe Telegraph and Trust Company have resolved not to entertain at present any further applications for the exchange of shares.

THE total traffic receipts of the Great Northern Telegraph Company for the month of November amounted to 314,578 fr. (£12,583), and for the same month in 1872 to 229,187 fr. (£9,167), showing an increase of £3,416. The receipts on the European lines amounted to 166,563 fr., against 124,915 fr., and on the China and Japan lines to 148,010 fr., against 104,272 fr.

THE receipts of the Submarine Telegraph Company for the month of November, 1873, amount to £8,851. The receipts for the corresponding month of last year amounted to £8,485.

THE total number of messages forwarded from postal telegraph stations in the United Kingdom during the week ending the 6th of December, 1873, was 339,099; and during the corresponding week of 1872, 285,646; showing an increase in the week of 1873 on that of 1872, 53,453.

TARIFF BUREAU. SEMI-MONTHLY CIRCULAR.

EXECUTIVE OFFICE,
WESTERN UNION TELEGRAPH COMPANY,
145 BROADWAY, NEW YORK,
January 1, 1874.

To all Offices on W. U. Lines:

The following changes and additions have been made since the date of the last Circular:

GENERAL INFORMATION.

Bolling, Ala., closed.
Communications relating to checks and business with Beaver Creek, Forks of Clear Creek, and Floyd's Hill, Col., should be addressed, "Care Manager, Denver, Col."

Warehouse Point, Conn., is now an office on Other Lines; tariff 30 and 3 from Hartford, Conn.

Crawfordville and Leesburg, Ga., closed.

The P. O. A. of Crystal Lake, Ill., is Nunda, McHenry Co.

Tioga, Ill., changed to Bensenville.

Auburn, Ind., is now a W. U. office, square 241; check direct.

Business for Auburn Junction, Ind., will hereafter be checked to Auburn, Ind.

Prairie City, Ind. Terr., closed.

The P. O. A. of Oskaloosa, Iowa, is Beacon, Mahaska Co.

Danforth, Me., closed.

The office at Fairfield, Me., will, until further notice, be closed at 6 o'clock p. m., daily.

Frostburg, Md., is now a W. U. office, square 122; check direct.

Clear Spring, Md., is now a W. U. office, square 103; check direct.

Business for East Kingston and Salmon Falls, N. H., will hereafter be checked direct.

Cape May C. H., N. J., re-opened.

The P. O. A. of Bull's Island, N. J., is Raven Rock, Hunterdon Co.

Palmyra, N. J., re-opened.

Moriens and Sheridan, N. Y., closed.

Spring Grove, O., closed.

Messages may be taken for the Longview Lunatic Asylum and the Hamilton County Infirmary, near Carthage, O. Charges for delivery from Carthage 15 cents for the former, and 25 cents for the latter.

Eppsville, Crawford Co., Pa., closed.

The office at Spring, Pa., square 150, is in Crawford Co.

The P. O. A. of Indian Creek, Pa., is Maple Grove, Fayette Co.

Halifax, Pa., closed.

Waynesburgh, Greene Co., Pa., is now a W. U. office, square 141; check direct.

Acton, S. C., closed.

Fort's Station, Tenn., re-opened.

Carroll, Tenn., closed.

The P. O. A. of Tantalum, Tenn., is Cowan P. O.

Honey Grove, Texas, re-opened. "Tariff for Other Lines" 50 and 3 from Sherman, 85 and 6 from Marshall, Texas.

On and after January 12, 1874, Grapeland, Tex., will be in square 484; Mineola, Tex., square 483, and Tyler, Tex., in square 483.

NEW OFFICES.

441 Boughton, Ark.

371 Swifton, Ark.

553 Henry's Station, Col.

* Navy Yard near Pensacola, Fla., 100 10 305 Pollard, Ala.

307 Bensenville, Ill.

368 Disco.

397 Cantril, Iowa.

346 Le Claire, Iowa.

* Big Clifty, Ky., 35 3 273 Elizabethtown, Ky.

243 Georgetown, Ky.

* Greenville, " 65 6 273 " "

254 Lancaster, " "

* Owensboro Junction, Ky., 60 6 273 Elizabethtown, Ky.

85 Emmittsburg, Md.

123 Grantsville, " "

85 Owings Mills, " "

85 Relisterstown, " "

85 Union Bridge, " "

85 Westminster, " "

32 Belchertown, Mass.

32 Three Rivers, " "

240 Nashville, Mich.

369 Troy, Mo.

47 Squan, N. J.

65 Blodgett's Mills, N. Y.

* Belle Centre, O., 50 3 201 Sandusky, O.

* Carey, O., 40 3 201 " "

* Castalia, O., 25 3 201 " "

* Kenton, O., 40 3 201 " "

170 Morristown, O.

232 Pontiac, Shelby Co., O. P. O. A. Kirkwood, Shelby Co.

* West Liberty, O., 50 3 201 Sandusky, O.

141 Brownsville, Pa.

151 Belle Vernon, Pa.

151 Beallsville, " "

151 California, " "

151 Cookstown, " "

151 Fayette City, " "

140 Coal City, " "

141 Carmichaels, " "

141 Davidson's Ferry, Pa.

113 Ebensburg, " "

151 Elizabeth City, " "

141 Greensboro, " "

141 Jefferson, " "

151 Lock No. 3, " "

151 Lock No. 4, " "

151 Monongahela City, Pa.

141 Rice's Landing, " "

123 Salisbury, " "

103 Waynesboro, " "

112 Williamsburg, " "

330 Greenfield, Tenn.

330 Sharon, " "

483 Lindale, Texas.

31 Mount Holly, Vt.

36 Putney, " "

36 Westminster, " "

141 Morgantown, W. Va.

356 Belmont, Wis.

335 Calamine, " "

335 Darlington, Wis.

335 Mineral Point, Wis.

356 Plattville, " "

335 Riverside, " "

ATLANTIC CABLE BUSINESS.

We are notified that the route to China and Japan via Siberia is interrupted.

CUBA CABLE BUSINESS.

We are notified that the Cable between Jamaica and Porto Rico is interrupted. Messages for the Windward Islands will be sent by mail from Kingston to St. Thomas.

In the notice relating to "official messages of the Spanish and United States Governments," given on page 15 of Supplement No. 4 of the Tariff Book, "Eighteen (18) cents for each additional word," should read "fifteen (15) cents for each additional word," on and after January 1, 1874.

WILLIAM ORTON, President.

EXECUTIVE OFFICE,
WESTERN UNION TELEGRAPH COMPANY,
New York, Dec. 29, 1873.

EXECUTIVE ORDER, No. 151.

Gen. ANSON STAGER,
Gen. THOS. T. ECKERT,
JOHN VAN HORNE,
JAMES GAMBLE,

Genl. Supts.

All "Franks" issued by this Company for the year 1873, are hereby continued in force until the 31st day of January, 1874.

GEO. H. MUMFORD,
Vice-President.

TRANSFER SERVICE.

EXECUTIVE OFFICE,
New York, Dec. 26th, 1873.

On January 5th, 1874, money order offices will be established at the following named points:

In E. P. WRIGHT'S District.

Cheboygan, Mich. Ionia, Mich.
Coldwater, " Niles, O.
Elkhart, Ind. Ravenna, O.
Findlay, O. St. Clair, Mich.
Galion, " Vermillion O.
Hillsdale, Mich. Wellington, "

In C. O. ROWE'S District.

Petrolia, Butler Co., Pa.

G. H. MUMFORD,
Vice-Pres't.

EXECUTIVE OFFICE,
New York, Dec. 31st, 1873.

To all Transfer Agents and Offices:

On and after January 15th, 1874, in all cases where the computation of tariffs on transfer messages at double the regular day rates makes the present rate exceed \$2 50 and 17, no charge will be made for such excess, so that after said date the tolls on a transfer message will in no case exceed \$2 50 for ten words and 17 cents for each additional word.

GEO. H. MUMFORD,
Vice-President.

TELEGRAPHERS' MUTUAL BENEFIT ASSOCIATION.

ACKNOWLEDGEMENT OF RECEIPTS FOR ASSESSMENTS Nos. 49, 50, 51 AND 52, UP TO DECEMBER 22.

2, 5, 19, 22, 23, 25, 27, 29, 31, 33, 37, 51, 53, 58, 65, 69, 75, 80, 82, 84,
88, 90, 93, 97, 100, 101, 103, 107, 108, 114, 120, 121, 126, 128, 129, 176,
177, 185, 186, 187, 201, 202, 206, 215, 220, 227, 230, 238, 240, 242, 246,
247, 252, 254, 258, 261, 268, 291, 294, 303, 316, 328, 330, 347, 350, 357,
362, 364, 366, 371, 372, 376, 379, 382, 392, 393, 398, 411, 412, 414, 431,
441, 451, 453, 455, 456, 457, 466, 468, 469, 470, 471, 474, 475, 476, 481,
482, 484, 505, 508, 511, 512, 514, 520, 527, 533, 542, 562, 555, 556, 557,
560, 565, 566, 569, 584, 590, 592, 604, 605, 617, 643, 649, 652, 659, 661,
690, 692, 694, 695, 697, 700, 701, 705, 710, 712, 717, 725, 729, 734, 735,
737, 738, 764, 766, 781, 782, 783, 785, 786, 790, 800, 802, 803, 804, 809,
820, 825, 836, 838, 841, 848, 851, 869, 875, 899, 904, 905, 906, 908, 920,
922, 926, 927, 928, 931, 934, 939, 944, 949, 977, 980, 996, 998, 1000, 1002,
1014, 1015, 1016, 1023, 1026, 1030, 1031, 1033, 1034, 1041, 1044, 1047,
1050, 1057, 1063, 1071, 1080, 1084, 1090, 1099, 1100, 1101, 1103, 1106,
1107, 1108, 1109, 1110, 1112, 1113, 1115, 1117, 1119, 1120, 1121, 1122,
1123, 1125, 1130, 1131, 1134, 1135, 1136, 1141, 1153, 1191, 1193, 1194,
1196, 1205, 1207, 1224, 1233, 1241, 1255, 1256, 1257, 1266, 1273, 1274,
1278, 1279, 1281, 1283, 1284, 1285, 1286, 1289, 1290, 1307, 1308, 1309,
1311, 1312, 1313, 1314, 1315, 1317, 1318, 1319, 1320, 1321, 1322, 1339,
1340, 1342, 1344, 1345, 1346, 1348, 1349, 1350, 1351, 1352, 1353, 1359,
1363, 1364, 1365, 1366, 1372, 1385, 1387, 1389, 1390, 1391, 1393, 1399,
1400, 1405, 1406, 1412, 1415, 1426, 1427, 1430, 1432, 1433, 1437, 1438,
1439, 1449, 1450, 1452, 1456, 1461, 1462, 1465, 1469, 1471, 1474, 1475,
1476, 1481, 1483, 1484, 1485, 1490, 1496, 1500, 1501, 1502, 1503, 1504,
1513, 1514, 1524, 1528, 1529, 1530, 1532, 1539, 1543, 1546, 1556, 1557,
1559, 1562, 1570, 1573, 1580, 1586, 1597, 1598, 1599, 1600, 1601, 1603,
1604, 1605, 1606, 1607, 1608, 1609, 1610, 1611, 1612, 1613, 1616, 1619,
1620, 1625, 1639, 1641, 1642, 1643, 1649, 1653, 1655, 1657, 1666, 1669,
1670, 1672, 1673, 1677, 1689, 1690, 1691, 1692, 1699, 1700, 1702, 1704,
1714, 1715, 1716, 1718, 1722, 1726, 1727, 1729, 1731, 1737, 1741, 1742,
1743, 1746, 1747, 1750, 1751, 1752, 1753, 1754, 1755, 1756, 1757, 1758,
1759, 1760, 1761, 1763, 1768, 1769, 1771, 1772, 1778, 1779, 1780, 1785,
1786, 1790, 1794, 1795, 1796, 1797, 1804, 1807, 1808, 1810, 1811, 1812,
1814, 1823, 1824, 1827, 1828, 1829, 1832, 1833, 1834, 1835, 1836, 1837,
1838, 1854, 1857, 1858, 1859, 1862, 1874, 1876, 1877, 1879, 1880, 1888,
1889, 1895, 1896, 1897, 1901, 1910, 1980, 1981, 1983, 1984, 1985, 1989,
1941, 1945, 1946, 1947, 1953, 1954, 1958, 1962, 1963, 1964, 1966, 1969,
1971, 1972, 1974, 1975, 1976, 1978, 1980, 1985, 1986, 1992, 1993, 1994,
1995, 2005, 2006, 2007, 2008, 2009, 2010, 2012, 2020, 2023, 2027, 2042,
2044, 2048, 2050, 2051, 2052, 2054, 2055, 2064, 2066, 2068, 2070, 2072,
2077, 2078, 2080, 2081, 2085, 2088, 2090, 2091, 2092, 2095, 2102, 2107,
2108, 2109, 2113, 2118.

ASSESSMENTS NOS. 53 AND 54, UP TO DECEMBER 22.

4, 5, 8, 13, 15, 17, 21, 23, 25, 26, 28, 29, 46, 52, 53, 54, 56, 59, 60, 64,
65, 67, 72, 74, 75, 76, 77, 78, 82, 86, 88, 89, 90, 91, 99, 103, 108, 113,
114, 121, 129, 131, 133, 145, 157, 179, 183, 188, 206, 211, 215, 218, 220,
223, 225, 245, 254, 257, 269, 274, 276, 277, 278, 279, 281, 282, 283, 285,
286, 301, 302, 311, 312, 342, 344, 346, 349, 351, 352, 353, 361, 367, 372,
378, 380, 381, 383, 391, 394, 402, 405, 411, 412, 413, 416, 426, 434, 438,
456, 464, 467, 474, 478, 509, 510, 520, 526, 532, 533, 536, 542, 546, 547,
549, 553, 554, 555, 564, 566, 569, 574, 576, 579, 587, 594, 600, 603, 604,
605, 615, 620, 626, 642, 646, 656, 661, 672, 678, 680, 685, 696, 703, 708,
714, 715, 721, 722, 731, 740, 741, 742, 764, 766, 772, 775, 791, 797, 799,
803, 815, 821, 832, 851, 858, 859, 870, 873, 874, 875, 876, 883, 886, 911,
915, 916, 917, 922, 923, 929, 931, 932, 938, 941, 943, 944, 952, 976, 1001,
1009, 1023, 1024, 1039, 1041, 1046, 1054, 1056, 1061, 1073, 1074, 1075,
1076, 1080, 1081, 1084, 1085, 1088, 1090, 1126, 1143, 1147, 1148, 1149,
1154, 1155, 1156, 1157, 1159, 1160, 1162, 1164, 1167, 1169, 1173, 1174,
1175, 1178, 1183, 1185, 1191, 1195, 1199, 1205, 1225, 1227, 1232, 1233,
1237, 1238, 1245, 1248, 1251, 1252, 1257, 1259, 1260, 1266, 1270, 1271,
1273, 1276, 1282, 1290, 1292, 1294, 1296, 1300, 1304, 1306, 1325, 1327,
1329, 1333, 1336, 1343, 1345, 1358, 1354, 1355, 1356, 1357, 1359, 1363,
1364, 1365, 1368, 1376, 1394, 1398, 1402, 1403, 1404, 1407, 1410, 1412,
1425, 1426, 1440, 1444, 1448, 1451, 1453, 1454, 1455, 1456, 1483, 1484,
1489, 1490, 1502, 1506, 1507, 1508, 1516, 1517, 1518, 1522, 1524, 1527,
1535, 1550, 1552, 1554, 1555, 1564, 1568, 1569, 1571, 1579, 1589, 1590,
1591, 1593, 1594, 1615, 1626, 1629, 1634, 1644, 1658, 1660, 1661, 1662,
1663, 1664, 1665, 1680, 1708, 1730, 1732, 1735, 1742, 1745, 1763, 1780,
1798, 1803, 1809, 1811, 1812, 1815, 1818, 1825, 1831, 1844, 1845, 1852,
1862, 1867, 1869, 1877, 1880, 1881, 1894, 1901, 1903, 1906, 1915, 1919,
1926, 1931, 1943, 1944, 1950, 1951, 1964, 1965, 1970, 1985, 1986, 1996,
1997, 1998, 1999, 2000, 2001, 2019, 2021, 2023, 2026, 2027, 2028, 2029,
2030, 2033, 2035, 2036, 2040, 2052, 2055, 2063, 2069, 2073, 2082, 2083,
2086, 2090, 2093, 2094, 2097, 2099, 2103, 2114, 2116, 2118, 2119, 2120,
2121, 2126, 2129, 2131, 2133, 2135, 2136, 2138, 2143.

MISCELLANEOUS.

No. 49.—95, 569, 595, 1088, 1409, 1459, 1957, 2105, 2123, 2125,
No. 50.—95, 569, 595, 1088, 1409, 1459, 1957, 1968, 2123, 2125, 2127,
2

CORRESPONDENCE.

SUGGESTIONS.

CLEVELAND, Dec. 7, 1873.

To the Editor of the Journal of the Telegraph:

It would be a good idea if every office before commencing to send a message would give call of its office. For instance, Cincinnati commences thus: C. Fr. St. Louis, &c. In case of error in message it could be traced back to office from whence it was received without guess-work. Old operators in an office generally know the calls of all, or most all, offices with which they are connected. Very often a message which is repeated takes a different route from its regular one, and in case of error in message, unless office call is attached, a good deal of unnecessary work must be overhauled to find office which repeated the message. It would also be very convenient in cases where messages are received from remote, new, or apparently unknown, offices, to have call of repeating office added to them in order to more easily trace their route, more especially in case of an error or an answer. In receiving messages where compound words occur, such as New-York, 1, or New York, 2 words, the operator sending the message would very often save miscount by receiver, if he would say N. Y. 1 or N. Y. 2 words immediately after sending the words, and not wait to be asked, after conclusion of message, whether N. Y. was one or two words, to make checks correspond.

There is nothing new about these suggestions, as some offices practice them at present, but if they were adopted by all offices much confusion and delay would be obviated. C. F. S.

A PROBLEM.

To the Editor of the Journal of the Telegraph:

Here is a little problem to which I would like to invite the attention of such of your readers as take an interest in such things, premising with the remark that some to whom it has been submitted have found its solution rather more difficult than appeared at first sight.

Two wires between stations A and B are crossed. The resistance of the first wire between A and the cross is 3,000 ohms, and between the cross and B 2,000. The resistance of the second wire between A and the cross is 1,000 ohms, and between the cross and B 4,000. If the resistance of the cross itself is 1,000 ohms, what is the combined resistance of the wires between A and B? X. Y.

To the Editor of the Journal of the Telegraph:

A wire 100 miles long gives a mileage resistance of 1,300,000 ohms. Reading 13,000 ohms. Disconnected midway, the first 50 miles gives a mileage resistance of 4,850,000 ohms. Reading 97,000 ohms. Required the mileage resistance of the second 50 miles. Please give the formula in full.

G. W. A.

Answer.—The insulation of the first 50 miles is 97,000, and of the first and second combined 13,000. The resistance of the second 50 miles is therefore—

$$\frac{97,000 \times 13,000}{97,000 + 13,000} = 15,011$$

and the mileage resistance of the second 50 miles is $15,011 \times 50 = 750,550$.

The rule covering this case is this. When the resistance of two circuits combined is given, and also the resistance of one of the circuits, to find that of the other divide the product of the two known resistances by their difference.

To the Editor of the Journal of the Telegraph:

Suppose a customer presents a message to be sent, contents of which we know to be false, and which is calculated to put the party to whom addressed to considerable inconvenience and expense, would we be justified in refusing to transmit such a message?

Answer.—You would not be justified in refusing to transmit any message offered which conforms to the rules of the Company. Of the truth or falsity of a dispatch the Company can assume no knowledge.

CHENANGO FORKS, Dec. 19, 1873.

To the Editor of the Journal of the Telegraph:

I see by JOURNAL of Dec. 15th that the President's Message, of 10,635 words, was transmitted from Washington, D. C., to New York in fifty-nine minutes. Will you please inform me through the JOURNAL, the manner in which it was done, whether by Morse system, spelling each word out in full, or by some shorter method?

Answer.—It was done with the Morse system, eight wires being used.

ROSS, IND., Dec. 17, 1873.

To the Editor of the Journal of the Telegraph:

I forward a message, the check of which is "collect." It reaches its destination "paid." It was received at two repeating offices correctly, the error occurring with its last transmission. Who is responsible? AGENT AND OPERATOR.

Answer.—The responsibility for the error is between the last repeating office and the office of destination.

McCay.—We cannot inform you where operators' gold badge-pins can be procured.

X. Y. Z.—There are three words in "Seek no further" (the name of an apple).

DURATION OF THE LIGHTNING FLASH.

Since the time of Franklin, the lightning flash has been regarded as a gigantic electric spark produced in the atmosphere. The inquiry therefore involved the nature of the meteorological discharge as well as of the spark artificially produced. Various attempts to determine the duration of lightning have been made with varying results. Faraday observed it without any instruments for measuring the time, which seemed to last for a second, but he was doubtful if part of the effect was not due to the lingering phosphorescence of the cloud. Decharme observed the lightning flashes from a distant storm, which also appeared to last for from a half to an entire second. Prof. Dove employed a revolving disk with colored sectors, and satisfied himself that single flashes of lightning often consisted of a number of instantaneous discharges. It is well known that when a rapidly moving train of cars is illuminated at night by lightning, it seems to stand still—that is, the duration of the flash is so brief that no motion of the train is perceptible while it lasts. The wheels are sharply defined, as if perfectly motionless, but if they had a blurred aspect we should know that the illumination lasted sufficiently long to render the motion perceptible. Prof. Rood extemporized a simple contrivance for observing lightning which acted upon this principle. It consisted of a white card-board disk five inches in diameter, with a steel shawl-pin for an axis, on which it was made to revolve by striking the edge. He traced black figures near the circumference of the disk, and when it was in rapid motion these figures were sometimes seen as sharply as though they had been stationary, although they were often blurred as though the disk had moved through a few degrees during the act of discharge. He then cut narrow, radial apertures

into the circumference of the disk, and observed the lightning through these openings. Here, again, the apertures were sometimes seen quite unchanged, but they were more frequently elongated into well-defined streaks some degrees in length. He afterward measured the average rate of rotation imparted to the disk in this way, and arrived at the conclusion that the lightning flashes on the occasion referred to had a duration of about one five-hundredth of a second. Dissatisfied with the roughness of these observations, Prof. Rood arranged a small train of toothed wheels driven by a spring, which rotated a circular pasteboard disk with four open sectors. This instrument gave more regular and precise results; and, while it was shown that the flash sometimes lasts for a whole second, the suggestion of Dove was clearly verified that each flash "consisted of a considerable number of isolated and apparently instantaneous electrical discharges, the interval between the components being so small that, to the naked eye, they constituted a continuous act."—*From "Quicker than Lightning," in Popular Science Monthly for January.*

ELECTRICITY AS A MOTIVE POWER.

The public has become so familiarized with the employment of electricity as a means of telegraphic communication that it has lost sight of the fact that it is an agent which is capable of being applied advantageously to many other purposes. At the present time some of the most eminent electricians of the day are, we believe, devoting their attention to the perfecting of plans by which very important results may be obtained in connection with various branches of industry. We believe that the time is not far distant when some practical difficulties which stand in the way of the more general application of electricity, even to locomotion itself, will be overcome, and even railways may be worked by electricity instead of by steam. While awaiting this consummation, there are, however, some matters in which success has already been achieved, and others in which very important results are on the eve of accomplishment. We hope shortly to be able to announce very great improvements in the production of artificial light for light-houses, for public buildings, and for the leading public thoroughfares, by the substitution of electricity for the present modes of illumination. Further improvements may also be anticipated of an exceedingly economical character in connection with the electrotyping process, the coating of metals and other substances; its application to break power upon railways, and a very simple and efficient mode of effecting communication in railway trains. We hope to be able in our next to give more definite information upon these points, as well as some particulars of the principal combination by which these and other improvements are to be carried into effect.—*Railway News, Dec. 6.*

FIRST PATENTS GRANTED IN THE UNITED STATES.

—The first patent issued in the United States, of which there is any record, was granted to Samuel Hopkins, on July 31, 1790, for making pot and pearl ashes. The second was to James Stacy Sampson, on August 6, 1790, for making candles; and the third and last for the year 1790 was to Oliver Evans, for making flour and meal. The latter bears date December 18, 1790.

MM. THÈVE and CHEDEVILLE find that if a current of electricity traverses a coil of wire that surrounds a cooling ingot of cast steel, the steel, when perfectly cold, shows on fracture a finer grain than when the current is not passed. The magnetized steel also had less power of resisting forces of extension and compression.—*Scribner.*

Journal of the Telegraph.

This Journal is issued on the 1st and 15th of each month. Its circulation is over 8,000. It goes to every State, Territory and Province on the Continent. It has become a necessity, and is always welcomed as a friend. No better medium for advertising exists.

TERMS:

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JOURNAL OF THE TELEGRAPH,

Western Union Telegraph Company,
145 Broadway, New York.

NEW YORK, JANUARY 1, 1874.

SIGNAL SERVICE MESSAGES.

Many offices check and book Signal Service Messages (particularly those addressed to Washington) "collect" instead of "paid."

All messages from Signal Service Officers or Observers should be checked "paid" at Government rates, and the messages returned monthly, with account current, credit being taken for them by a special entry therein, as per Executive Order No. 144.

Signal Service Messages from or to connecting lines should be checked and booked by Western Union Offices as if originating or terminating on this line. Connecting offices should not pay other lines any charges upon them, as each company collects its charges direct from the Government.

THE Press has been publishing the record of the transmission of the President's message by the Automatic Telegraph, great merit being claimed because sent by a single wire in 30 minutes. Will any member of the Press explain why, with such capacity, it required $4\frac{1}{2}$ hours to deliver that message? What the public want is not processes, but execution. Now, we claim that if it takes as long to prepare a message for transmission by one process as to transmit it by another, the latter process, in all but exceptional circumstances, must have the advantage. For this reason we assume that if the Automatic system, with its multiplied processes, has any value, it can be only as an auxiliary of the direct method.

ON December 18th, the lines of the Pacific and Atlantic Telegraph Co. were formally leased to the Western Union Telegraph Co. The terms of the lease are four per cent. on a capital of \$2,000,000—three-fourths of which is already owned by the W. U. Company. By this lease about 10,000 miles of wire are added to the Company's property, and the simple stoppage of double rentage of offices will probably more than meet the terms of the lease.

WE commence to-day, on our first page, the publication of a series of articles on the English Telegraphs, being portions of a report made by Mr. George B. Prescott, as the result of his recent European visit.

PERIODIC NONSENSE.

There is no class of writers more to be dreaded, and none so pernicious in their influence, as the men who use a facile pen with an assumed knowledge. And yet a large class of such men hold the gateways of our periodical literature. They have to write so much and of so many things, that, perhaps, it is not wonderful that, on subjects which demand thought and precise knowledge, they should deliver themselves of conclusions utterly visionary and impracticable. And it is only because of some subtle public sense of their baselessness that they are disarmed of their power, that the theories they advocate fail of fruition, and have currency without prevailing harm.

We are led to this preamble by two articles, one in the December number of *Old and New*, and the other in the *Christian Union*, on the subject of the Postal Telegraph. They are twigs from the same bough. The Editor of the one has read the Postmaster-General's report, and the other has read what his confrere has said about it. The result is that they toot the same horn, and differ only in their power of wind. They have the merit of being brief, and are, therefore, easily answered.

Mr. E. E. Hale, of *Old and New*, after a chuckle over some supposed griefs which gigantic monopolies have brought upon themselves, hopes the time has come when the telegraph can be taken by the Government and given to the people, as in Great Britain. Now we suppose that the point desired in this devout wish is, that the terms of the telegraph in America correspond to those of the sea-girt isle which supplies so much ready food for our postal reformers. The rate in Great Britain is one shilling. In America the average is, in sterling, two shillings or fifty cents. The most distant points in the former are apart 600 miles; in the latter, six thousand. In the former the country is old, the highways solid and matured, and expense of repairs small; in the latter the country is largely new, routes constantly changing, and expense of repair and maintenance great. We contend, therefore, that on a fair basis of estimate the American tariff is not greater than the British. We might claim it to be much less. And if we estimate values and examine what the product of the American fifty cents is in America, as compared with a shilling in Great Britain, it will be found that the one as a purchasing medium is the simple equivalent of the other. Ergo, the American tariff within 6,000 miles is as low as the British within 600!

As to England and her telegraphs we have only to refer to the exhaustive article which opens this number of the JOURNAL to show how vast the burden their purchase has imposed.

The *Christian Union* is not so modest as *Old and New*, and sees no reason why a dispatch cannot be as cheap as a letter, and be sent anywhere for three cents! Why not? There is sublime conceit in the inquiry. We might ask why letters are not sent free. Simply, we suppose, because they cost something. Now, we wish to say to the *Christian Union*

that messages do actually cost 70 per cent. of the existing tariff. If, therefore, messages be sent for three cents, or less than one-tenth of their actual cost, will the *Christian Union* say who shall bear the nine-tenths? Will it point us to any method for cheapening transmission, by which the cost can be obliterated or reduced? will it tell us how? If the cost of delivery alone be three cents, 150,000 miles of line, and 10,000 men, and 7,000 offices, are to be sustained without cost? Will the *Christian Union* speak?

We note that *Harper's Weekly* concedes "that the use of the telegraph would be cheaper in public than in private hands is improbable, and cannot be proved by English precedent." We commend the *Weekly* for its late-found wisdom.

NEW SECRETARY AND TREASURER OF THE GOLD AND STOCK TELEGRAPH COMPANY.

MR. HENRY H. WARD, who for a number of years has been Superintendent at New York of the New York, Newfoundland and London Telegraph Company, has been appointed Secretary and Treasurer of the Gold and Stock Telegraph Company, and assumes the duties of that position on the 1st of January. Mr. Ward has filled many positions of prominence in the telegraphic profession, having been respectively Assistant Manager of the New York office and Superintendent of the Metropolitan (New York) District for the American Telegraph Company, and, after the consolidation, Manager of the New York Office for the Western Union Company. This position he resigned for the Superintendency of the Newfoundland Company's interests in New York, and since the consolidation of the Newfoundland and the Cable companies he has continued as their agent.

Mr. Ward takes to his new position an experience which will no doubt prove exceedingly valuable to the company with which he will hereafter be connected.

TELEGRAPHIC CONVENTION OF SYMPATHY.

The operators along the line of the Mississippi and Tennessee Railroad met in convention, each in his respective office, on the evening of December 9th, 1873, for the purpose of adopting resolutions of condolence with the family and relatives of Mr. W. A. Cox, Manager of the Western Union Office at Batesville, Miss., who died of typhoid fever, November 18th.

Mr. Thomas F. Marshall of Grenada presided, and Mr. R. N. Abbey of Sardis acted as secretary. Appropriate resolutions, testifying as to the worth and exemplary character of Mr. Cox, and the esteem in which he was held by his associates, were adopted. The concluding resolution, in which we join heartily, was:

"That we deeply sympathize with his father, mother, brother, and wife, whose grief, all unconsolable as it must be, is tempered with the remembrance of the promise of the reunion of the blest in that bright post of eternal rest—that blessed Heaven upon whose green shores the angel of death never wanders, the flowers never fade, nor loved ones pass away, but where the sunshine of glory eternally reigns."

It was resolved, further, that the proceedings of the Convention be published in the JOURNAL OF THE TELEGRAPH and the *Panola Star*, and that a copy be sent to the family of the deceased.

THE GOVERNMENT TELEGRAPHS AND THE RAILWAYS.

The *Pall Mall Gazette*, quoting the *Western Morning News*, observes that an error of enormous magnitude has been discovered in the Government telegraph accounts. "Instead of purchasing, as was supposed, a freehold and absolute title, the Government finds that it purchased the leasehold only from the telegraph companies whose rights were bought up in many instances. The telegraph lines were leased from the railway companies, and what they sold was merely a lease of them. The railway companies are represented as being now engaged in 'preparing their claims.' Some of these, it appears, are uncomfortably large. The claim of the Lancashire and Yorkshire Railway for the telegraph line which the Government fondly imagined it had purchased from the Magnetic Company amounts, according to the *Western Morning News*, to £950,000. The matter is to be referred to two arbitrators—Mr. Weaver, secretary of one of the telegraph companies, on the part of the Government, and Sir John Hawkshaw, on the part of the Lancashire and Yorkshire Railway. Sir John Karslake is to be umpire." The approach of an arbitration of much public interest and importance, which is thus alluded to, can scarcely, however, be fairly called an error, nor is it possible in purchasing the rights of the telegraph companies the Government imagined itself to be acquiring the whole of the privileges connected with telegraphs in the country. The Telegraph Act, 1868, after giving powers to purchase the undertakings of telegraph companies, goes on to recite that the railway companies on their part are either owners of telegraphs or they have contracts with telegraph companies whose apparatus is placed in the stations and along the railways and canals of the railway companies. Powers are, therefore, given in this Act of 1868, to the Postmaster-General to take the place of the telegraph companies in such contracts with the railway companies, and to pay the railway companies compensation, either to be agreed upon or to be fixed by arbitrators, for the loss of present and reversionary gains. The Lancashire and Yorkshire Company is mentioned by name in this Act as one of the railway companies with which arrangements will have to be made, and no agreement having been come to, although negotiations have been going on ever since the passing of the Act, the time has now come when a decision will have to be arrived at by arbitration, as provided in the Act, and before Sir John Karslake as umpire. Eminent counsel have been retained on both sides. The Marquis of Salisbury, as umpire, has already pronounced on a somewhat similar claim, involving, however, a much smaller amount than the sum to which, on the part of the Lancashire and Yorkshire Company, it will probably be contended that company is entitled. The Act of 1869 estimated £700,000 as a sufficient sum to cover the whole expenses of the Government in this part of the transfer of the telegraphs. The Lancashire and Yorkshire Company alone now demand a million or more. But it will be obvious that neither the Government nor the company is a fair judge in its own cause, and the public will look with interest for the decision of Sir John Karslake and his experienced assessors. The arbitration will involve difficult and intricate matters of account.

Mr. CHAS. A. TINKER, General Train Despatcher, has been appointed Superintendent of Telegraph for the Central Vermont Railroad Co., and will have charge of all Telegraph Lines belonging to the Railroad or connected with its interests.

REMARKABLE OPERATION BY ELECTRICITY.

The Whitehall (New York) *Times* tells of a remarkable operation performed by a physician of that place. A gentleman who had been suffering from a superabundance of adipose tissue consulted a physician, asking for relief from his burden. The doctor told him he could relieve him, if he would consent to a painful operation. The gentleman consented, and with the medical practitioner entered the telegraph office at this place. The fat man was requested to remove his coat and vest, after which the physician surrounded him with wires, attaching the end to a powerful galvanic battery. At a signal from the doctor, Manager W. B. Eddy let on the current. The patient writhed and twisted when he felt the current passing around him, yet he stood it like a martyr. Presently he began to shrink; he grew smaller and smaller; his clothing hung in bags about his fast diminishing form. The doctor felt much pleased at the result of his experiment, while the formerly fat man's joy was very great, although he seemed to be suffering most acute pain. All of a sudden there was a loud clicking at the instrument, as if Pandemonium's great hall had been let loose. The operator sprang quickly to answer the call. He ascertained it was from the New York office. He quickly asked, "What's up?" An answer came back as if some infuriated demon was at the other end of the wire, "What in thunder are you about? Cut off your wires quick; you are filling the New York office with soap grease."

REGULAR EATING.

Half of all ordinary diseases, says Dr. Hall in his *Journal of Health*, would be banished from civilized life, and dyspepsia become almost unknown, if everybody would eat but thrice a day at regular times, and not an atom between meals, the intervals being not less than five hours, that being the time required to digest a full meal and pass it out of the stomach.

If a person eats between meals, the process of digestion of the food already in the stomach is arrested, until the last which has been eaten is brought into the condition of the former meal; just as if water is boiling, and ice is put in, the whole ceases to boil until the ice has been melted, and brought to a boiling point, and then the whole boils together.

But it is a law of nature that all food begins to decay, after exposure to heat and moisture for a certain time. If the meal is eaten, and in two hours another, the whole remains undigested for seven hours, before which time the rotting process commences, and the man has his stomach full of carion—the very idea of which is horribly disgusting.

As, then, all the food in the stomach is in a state of fermentive decay, it becomes unfit for the purposes of nutrition and for making good pure blood. Small wonder is it that dyspeptics have such a variety of symptoms, and aches and complaints in every part of the system, for there is not one drop of pure blood in the whole body; hence the nerves, which feed upon this impure and imperfect blood, are not properly nourished, and, as a consequence, become diseased. They "complain" they are hungry—and like a hungry man—are peevish, fretful, restless. We call it nervousness, and no one ever knew a dyspeptic who was not restless, fidgety and essentially disagreeable, fitful, fretful and uncertain.

The stomach is made up of a number of muscles, all of which are brought into requisition in the process of digestion. But no muscle can work always. The busy heart is in a state of perfect repose for one-

third of its time. The eye can work twice in a second, but this could not be continued five minutes. The hands and feet must have rest, and so with the muscles of the stomach—they only can rest when there is no work for them to do, no food in the stomach to digest. Even at five hours' interval, and eating thrice a day, they are kept constantly at work from breakfast until the last meal is disposed of—usually ten o'clock at night. But multitudes eat heartily within an hour of bed time. Thus, while the other portions of the body are at rest, the stomach is kept laboring until about daylight, and made to begin again at breakfast time. No wonder is it that the stomach is worn out—has lost its power of action. Many girls become dyspeptic before they are out of their teens, in consequence of being about the house, and nibbling at everything they lay their eyes on that is good to eat.

In the printing office of the *Cleveland Ledger* a gas pipe had been plugged with a hard wood stopper, at a point several feet from any burner. About six inches below it passed a belt, running from one pulley to another, and in operation during the day. About four days after the plug had been driven into the pipe it was noticed to be on fire, and a bright jet of light as if from a burner, burst forth from the side of the plug, which was already charred, and being rapidly burned up. The question now was, how the flame had originated. It was certain that no one had lighted it, nor had any fire come near it. The only conclusion possible was, that it was caused by electricity from the belt, and a full investigation confirmed this conclusion. Had it happened in the night-time, it might have enkindled an extensive conflagration, and its origin would never have been known.

The report recently presented by the royal commission appointed on scientific instruction in England contains a very large amount of evidence presented by scientific men of eminence. The tendency of the great mass of the evidence is in favor of the more direct encouragement of science by the State, especially in those researches the remuneration of which comes only after the lapse of a long time, but which may nevertheless ultimately be of great economical importance. The increase of the number of professorships, and rendering the emoluments independent of the number of pupils, are strongly urged by some. An unfavorable contrast is drawn by some of the witnesses between the encouragement afforded to science by the English government and that extended by the governments of France and of the United States.

BORN.

GETTY.—At Mason City, Ill., Dec. 11, 1873, twin daughters to John R. Getty, formerly Manager of W. U. Tel. Office, Hearne, Texas.

WELCH.—At Pulaski, Pa., Dec. 18, 1873, a daughter to E. L. Welch, Manager W. U. Tel. Office, Pulaski.

MARRIED.

BORDEN—GASSNER.—At Salem, N. J., Nov. 27, 1873, James Y. Borden, Manager W. U. Tel. Office, to Miss Lizzie A. Gassner.

EASTMAN—LONG.—At Lynn, Mass., Dec. 6, 1873, by Rev. Mr. Boutelle, Mr. Eben Eugene Eastman, operator at Augusta, Me., to Miss Sarah Elizabeth Long, of Sumter, S. C., late operator at Lynn. No cards.

KENNEDY—CARSON.—At Montreal, P. Q., Sept. 4, 1873, Mr. George Kennedy, lineman Montreal Tel. Co., Plattsburgh, N. Y., to Miss Mary Carson of Franklin, P. Q.

DIED.

ADAMS.—At Elwood, N. J., Nov. 6, 1873, Mary E., wife of J. M. Adams, Manager W. U. Tel. Office.

CRANE.—At Dalton, Mass., Nov. 31, 1873, of typhoid fever, Frank L. Crane, aged 22 years.

SIMMONS.—At San Francisco, Cal., Dec. 22, 1873, Charles F. Simmons, of the Fire Alarm Telegraph, formerly of New York.

DYNAMICAL THEORIES OF HEAT.

Professor W. A. Norton publishes in the *American Journal of Science and Art* a lengthy treatise on the above topic, more especially in answer to the query: Is heat any mode of motion of the atoms of ordinary matter; such atoms being regarded, in accordance with the common notion of an atom, as incapable of experiencing any change either of form and dimensions, or in the intensity of their acting forces? The conclusions arrived at are that the atoms of bodies must be made up of distinct parts, bound together by certain forces; and that heat must consist in some movement or relative displacement among these constituent parts of the atoms.

Two possible conceptions of an atom with its essential accompaniments are given: That it consists of a true atom, surrounded solely by an atmosphere of luminiferous ether, or that it has, in addition, an envelope of distinct electric ether immersed in the ethereal atmosphere. In view of these results, it is considered probable that heat and light originate in some mode of motion occurring in the ethereal atmosphere or in the electric envelopes of the atoms, or, more probably, in the force or forces by which such a movement is produced.

Simplified, Professor Norton's theory, though at first conveying the negative idea of a complex atom, transfers the source of heat from the atom proper to a supposed ethereal atmosphere or electric envelope, one or both, and, therefore, following the hypothesis, to a form of matter considered to be nearly, if not quite, as subtle as the medium of light, and whose elastic forces are nearly or quite as intense.

ON THE COMPARISON OF ELECTRIC MACHINES.—

By *M. Mascart*.—The apparatus for producing static electricity can be compared between themselves as well as ordinary batteries. As the electromotive force and internal resistance of an element determines its value, so an electric machine may be defined by two constants:—1. The difference of potential that it is capable of establishing between two conductors; 2. The quantity of electricity it can supply in a given time. In the following table the Holtz machines were warmed, and all the experiments were made under such conditions as would produce the maximum effect for each instrument:

	Diameter of plate.	Quantity	
		Per turn.	Per sec.
Ordinary Ramsden machine ..	0.97	1.00	1.00
Larger ditto ..	1.63	1.70	1.70
Ditto, with insulated cushions ..	0.98	1.00	1.00
Marum's Machine ..	0.84	1.40	1.40
Nairne's cylinder ..	0.32	0.18	0.27
Holtz ordinary machine ..	0.55	0.45	4.50
Ditto, with two plates ..	0.55	0.86	8.60
Ditto, with two plates } rotating inversely }	0.30	0.23	2.30
Carre's machine, with } vulcanite plate }	0.50	0.15	1.50
Armstrong's machine ..	—	—	2.40
Induction coil (large) ..	—	—	13.00

We perceive that for the first three machines the quantity is sensibly proportional to the diameter of the plate; however, the third machine differs from the first two not only by the insulation of its cushions but by the suppression of the vice or jaws, which were replaced by little cylinders situated at the side only of the disk. At the same time the table does not indicate the relative value of the machines, because the speed of rotation was not the same. Neither have I given the value of the potentials, because there appeared some uncertainty in the numbers obtained.

SECONDARY CURRENTS AND THEIR APPLICATIONS.

EXTRACT FROM MEMOIR BY M. PLANTÉ.

In studying the phenomena of his secondary couples (formed with plates of lead) the author found that the chemical change in the electrodes, which forms the source of the secondary current, is rendered more complete by a primary current being passed alternately in opposite directions, and repose allowed between each double action. By the former, the deposits of oxide are reduced, then recomposed, and the electrodes are thus modified in molecular constitution, not only at the surface, but by degrees interiorly, giving an increasing effect for years. By the latter (repose) the deposits of oxidized or reduced metal acquire a crystalline texture and a strong adherence, which contributes to protect the subjacent deposits tending to form under the action of the primary current. These operations M. Planté designates the *formation* of secondary couples. A secondary couple with less than half a meter of surface properly formed will, when charged with two Bunsen elements, reduce a platinum wire half a m.m. diameter during twenty minutes, or a wire $\frac{1}{2}$ m.m. diameter for an hour, without any communication with the primary source, and even forty-eight hours after being charged.

After formation has once been effected the secondary couple may be charged by a current acting always in the same direction. M. Planté exhibited an apparatus so arranged that, by touching a metallic point in a box containing a secondary couple, a platinum wire was heated, and might be used to light a candle, a spirit-lamp, or gas. The primary pile consisted of 3 elements of zinc and water, copper and sulphate of copper. The secondary couple once charged may give a hundred consecutive lightings. With an apparatus somewhat larger one may obtain 8000 or 4000. This mode obviates many disadvantages connected with the use of matches; and it is very economical. For there is no expense connected with the secondary couple; the lead and liquid do not need renewal. And to maintain the weak current of the primary pile necessary to charge the secondary couple one has only to add some crystals of sulphate of copper; the consumption of which is very small compared with the large number of lightnings obtainable. M. Planté proposes also to employ his secondary couples for electric bells, and describes how this may be done.

IMPORTANT EXPERIMENTS.

M. Ruhmkorff, to whom science already owes so much, still continues his experiments in electricity and magnetism. He has presented the following facts to the French Academy of Sciences:

If a bundle of iron wires, covered with thick copper wire, giving passage to an intermittent current from a battery, is then wrapped with fine wire, for the purpose of obtaining an induced current, that current will have more than double the usual intensity if we wrap the fine wire around the middle of the bundle, where there is no magnetization, instead of wrapping it near one of the poles. He concluded, from these premises, that he could get still more powerful effects by making a continuous ring of his iron wires, which would then present no poles; but in this he was disappointed, for the induced current gave a spark only 0.1 inch long. On cutting the ring, the spark at once increased to 0.2 inch, although the cut ends came together the moment they became magnetic.

On keeping the ends apart with a plug of wood 0.2 inch in thickness, the spark reached the length of 0.6 inch. With thicker plugs of wood, no further

change was produced. It still remains to be seen what practical application can be made of this fact.

Jamin, in studying the magnetism of thin steel plates, found, by magnetizing plates of various dimensions and superposing a number of similarly magnetized ones, that he could construct magnets carrying twenty times their own weight. The thinner the superposed magnetized plates, the more powerful the resulting magnet. His researches will probably reveal the law according to which magnets, having a minimum weight and a maximum carrying force, may be constructed.

It seems, too, as if we were rapidly approaching the solution of the problem of an electrical illumination for our streets and houses. The difficulties, hitherto, have been: that it is impossible to regulate the intense brilliancy of the electric light, which would be blinding on the street, and, of course, utterly unfit for lighting our houses; that it is not continuous, but requires the frequent renewal and adjustment of the carbon points, involving expense and complicated apparatus for each lantern; and, finally, that a separate source of electricity is required for each lamp. All these difficulties are said to have been obviated by the invention of Mr. Ladiguin, of St. Petersburg, which was recently exhibited by Kosloff & Co., the proprietors of his patent, in the Admiralty House of that city. His invention is as follows: Only one piece of carbon, or other bad conductor, connected with the magneto-electric machine, is placed in a glass tube exhausted of air, filled with some gas which will not combine with carbon at a high temperature and hermetically sealed. The carbon becomes gradually and equally heated, and emits a soft, steady, and continuous light. One machine, driven by a small three horse-power engine, is said to be capable of lighting many hundreds of such lanterns, which will burn under water and in mines as well as in a room. They are free from any danger of explosion, and have the additional advantage over gas, that they emit no poisonous evaporations detrimental to the health. The inventor calculates that these lamps can be lighted at one-fifth the expense of coal gas. If this invention should prove a success, few consumers will mourn the disappearance of gas companies.—*Scientific American*.

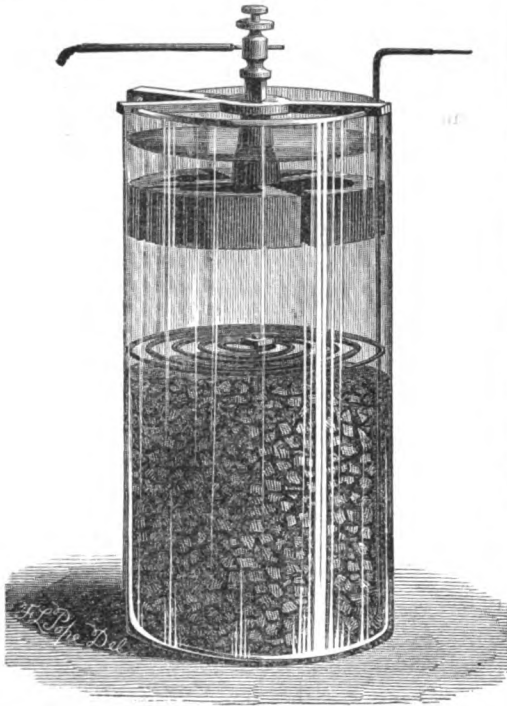
A NEW GALVANIC BATTERY.—Abbe Fiehol (says *Les Mondes*) has recently constructed a new battery, using a Spanish mineral, which is probably a kind of pyrites. Within a glass jar is placed a zinc cup 7 inches long, 3 inches deep, and 2 inches broad, into which the mineral is packed. Above is a piece of copper, and the interstices are filled with pulverized coke, mixed with ten per cent. of chloride of sodium (common salt), and moistened with water. Four elements, united with isolated copper wires—copper to copper and zinc to zinc—it is stated, gave a current of surprising energy, fully equal to that of five Bunsen couples. The battery is constant, and it has been found that, after eighteen months' continuous use, it operates as well as when first employed. The only condition seems to be that it should be kept thoroughly moistened.

A NEW ART IN WAR.—German troopers are now exercised in climbing up telegraph poles, and furnished with instruments to cut the wires. This is, of course, intended for service in an enemy's country, and the work is executed under cover of a dark night. The men are despatched across the country in couples; whilst one of the troopers dismounts, climbs up the pole, and cuts the wires, the other holds his comrade's horse, and keeps a look-out for any indication of interruption on the part of the enemy.

WANTED.—A Telegraph Operator capable of running trains on single track road.
An experienced man of good habits can hear of employment by addressing, with references,
X. Y. Z,
P. O. Box 3903,
New York.

THE PERFECT BATTERY.

CLEANLINESS. CONSTANCY. ECONOMY.



THE LOCKWOOD BATTERY,

PATENTED APRIL 8, 1873,

L. G. TILLOTSON & CO., Sole Agents,
No. 8 DEY STREET, N. Y.

This Battery has been in extended practical use for more than a year, and is now acknowledged by leading Electricians in this country and Europe to be

FAR SUPERIOR TO ALL OTHERS

for telegraphic purposes, or closed circuits of any description. This Battery received the **FIRST PREMIUM** over all competitors for

POWER, DURABILITY AND ECONOMY

AT THE

Cincinnati Industrial Exposition of 1873.

The size shown in the cut (No. 2), when charged with 5 lbs. sulphate of copper per cell, is capable of working two or three main circuits of average length for **MORE THAN ONE YEAR**, without any attention whatever. The copper and zinc solutions are perfectly separated, and there is

NO LOCAL ACTION,

and the circuit is **ABSOLUTELY UNIFORM** at all times. It is equally well adapted for a

LOCAL BATTERY,

or for any purpose requiring a uniform, powerful and constant current.

The number 2 size (price \$2.50) is now ready for sale. Other styles are in preparation, and will soon be put on the market. Send for Circular.

L. G. TILLOTSON & CO.,
8 DEY STREET, NEW YORK,
SOLE AGENTS.

NEW YORK, Oct., 1873.

We have appointed Messrs. L. G. TILLOTSON & Co. Sole Agents for the sale of the Lockwood Battery,

LOCKWOOD BATTERY CO.,
W. H. SAWYER, Secretary.

PENSACOLA TELEGRAPH CO.

C. L. LE BARON,

CHARLES LE BARON, JR.,

President.

Sec'y and Treasurer.

PENSACOLA, FLORIDA.

OFFICES IN

PENSACOLA, FLA.

FERRY PASS, FLA.

MOLINO, FLA.

MILTON, FLA.

PENSACOLA JUNCTION, FLA.

BAGDAD, FLA.

UNITED STATES NAVY YARD, PENSACOLA, FLA.

Connect with the lines of the **WESTERN UNION TELEGRAPH COMPANY** at Pollard, Ala.

Governed by the same Rules and Regulations as the Western Union Telegraph Company.

SECOND-HAND RELAYS.

A large lot of well polished and good working Relays for sale cheap.

Also several sets of

HICKS' REPEATERS,

In perfect order, at a nominal price.

GEO. H. BLISS & CO.,

41 Third Avenue,
Chicago, Ill.

RED STAR LINE.

ANTWERP SERVICE.

APPOINTED TO CARRY THE BELGIAN AND UNITED STATES MAILS.

From	Philad'a.	From	Antwerp.
"VADERLAND,"	Dec. 31	"NEDERLAND,"	Dec. 30
"NEDERLAND,"	Jan. 23	"VADERLAND,"	Jan. 28
"SWITZERLAND,"	Building.	"SWITZERLAND,"	Building.

PRICES OF PASSAGE:

First Cabin.....	\$100, gold.
Second Cabin.....	65, "
Steerage.....	35, currency.

Prepaid Certificates, \$36 currency.

LIVERPOOL SERVICE.

From	Philad'a.	From	Liverp'l.
"ABBOTSFORD,"	Jan. 1	"KENILWORTH,"	Dec. 24
"KENILWORTH,"	Jan. 15	"ABBOTSFORD,"	Jan. 2

PRICES OF PASSAGE:

Cabin.....	\$100 currency.
Steerage.....	30 currency.

Prepaid Certificates, \$32 currency.

Tickets will be sold here at lowest rates, good from Antwerp and Liverpool to all interior points in the United States, via the Pennsylvania Railroad and its connections, thus affording parties in this country a convenient and cheap opportunity of sending for their friends in Europe.

THE RED STAR LINE will give special attention to the comfort of steerage passengers; comfortable berths, well-ventilated sleeping apartments and good food will be furnished them. An experienced Surgeon is attached to each vessel.

Freight will be received at all principal points in the West and South, in connection with the Pennsylvania Railroad, Southern Mail Steamship Company and Clyde's lines, and through Bills of Lading issued for Antwerp, Bremen, Hamburg, Havre, Amsterdam, Rotterdam, Liverpool, London, Glasgow, Belfast, Hull and Leith.

The Red Star Line docks at Philadelphia are in direct connection with the Pennsylvania Railroad, and all merchandise intended for points beyond Philadelphia can be transferred from the hold of the steamer to the cars without the expense to shippers and risk of damage by re-handling, which results from cartage.

For rates of freight and passage, and other information, apply to

PETER WRIGHT & SONS,

GENERAL AGENTS, PHILADELPHIA.

William Hunter & Co., Agents, Liverpool. | B. Vonder Becke, General European Agent, Antwerp.

WATTS & COMPANY,

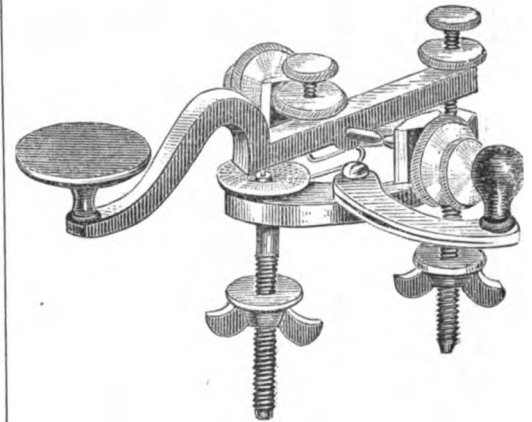
47 Holliday Street,

Baltimore, Md.,

SOLE MANUFACTURERS OF THE

PATENT CIRCUIT-CLOSER KEY,

Which has met with marked success.



Price, \$5 50 plain; \$7 nickel-plated.

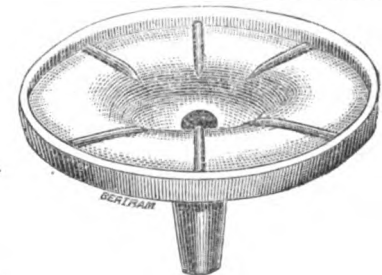
The following is from a competent judge, written after some weeks' trial.

145 BROADWAY, NEW YORK, }
Sept. 22d, 1873.

DEAR SIR,—Your circuit-closing attachment on the key, left with me for trial, is pronounced by all who have used it a decided and much-needed improvement on the common form.

Respectfully,

A. S. BROWN, Manager.



The Best Form of Battery Insulator Offered.

SIMPLE AND PERFECT.

Made of porcelain, handsome in appearance. Occupies little more space than the cell it supports. Each cell of battery completely isolated. Leakage is reduced to the minimum by the use of it.

General Superintendent Van Horn, Southern Division W. U. Tel. Co., writes of it:

"We have now in use a thousand or fifteen hundred of your battery insulators, and expect to order many more before the close of the year."

We have never used any battery insulator that equals it in any respect. In fact, it appears to be as near perfect as we can reasonably expect, in a contrivance for that purpose."

Price 40 cents

We offer a very excellent article of Galvanized Wire, superior to any in the market. The linemen on Baltimore and Ohio R. R. say they have never seen its equal for toughness and flexibility.

Special attention given to building. Estimates given for any amount of material for telegraph construction or extension.

SWITCHES, GALVANOMETERS, RESISTANCE COILS, &c., to order.

Designs for Switch Boards for special service furnished.

SCOTT'S PATENT ANNUNCIATOR,
for Hotels and Residences.



Security Message Hook.

PATENT APPLIED FOR.

The damage from the loss of a single message will equip a line many times with our new Hook, which gives great security.

Price 30 cents each.

Price per dozen \$3.00.

LIBERAL TERMS TO THE TRADE.

GEO. H. BLISS & CO.,

41 THIRD AVENUE, CHICAGO, ILL.,

GENERAL AGENTS.

WATTS & COMPANY,

47 Holiday Street,

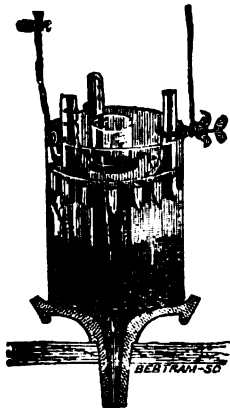
Baltimore, Md.,

MANUFACTURE

Telegraph and Electrical Instruments

OF EVERY DESCRIPTION.

Facilities for supplying any description of Machinery or Material equal to any in the United States.



Patented Dec. 31, 1872.

Over SIX THOUSAND cells of the Baltimore Battery in use by the Gold and Stock Telegraph Company of New York in their Private Line Department, is a sufficient acknowledgement of its merit, as a form of the gravity battery, combining the valuable principles of

Economy, Cleanliness and Constancy,
"—in fact a base-burner."

F. L. POPE

Telegrapher, July 5th, '3.

SELF-FEEDING,

No Sulphate of Copper can reach the Sulphate of Zinc Solution.

The shape of Zinc and Copper, which, with the tube, were patented December 31st, 1872, secures the largest surface with least weight of the metals. Half pound sulphate copper per month, ample supply for No. 2, or 3.

Following is one of the many letters we have from reliable telegraphers:

PIEDMONT, W. Va., September 28th, 1873.

Messrs. WATTS & Co.,
Baltimore, Md.

GENTLEMEN:—On January 1st, 1873, I put up 75 cells of your No. 2, Baltimore Battery, in place of 40 cells of carbon, from which two railroad wires of 100 miles each are supplied. It has not since been taken down or cleaned, and has required no attention, except to fill the tubes with blue stone, once each month, and replenish the fluid once or twice during this period, made necessary by evaporation.

I am fully convinced, from long experience, that this is superior to any other form of the gravity battery.

It has now been in constant use for nine months, and will not need new zinc until after January next.

Respectfully,

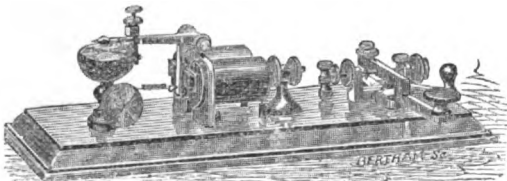
J. G. NESBITT, Manager.

ORDERS FOR THIS BATTERY PROMPTLY FILLED.

A large stock constantly on hand.

No. 1 for Electro-motors, R. R. signals or similar service, \$2.25
No. 2 ordinary local or Printing Telegraph main \$1.75
No. 3 ordinary main \$1.25

A very Superior Main Line Sounder.



Brass, \$22.50. Nickel-plated, \$25.00.

For wrecking purposes or temporary offices, this instrument is without a rival.

A perfect combination, handsome, good-sounding instrument.

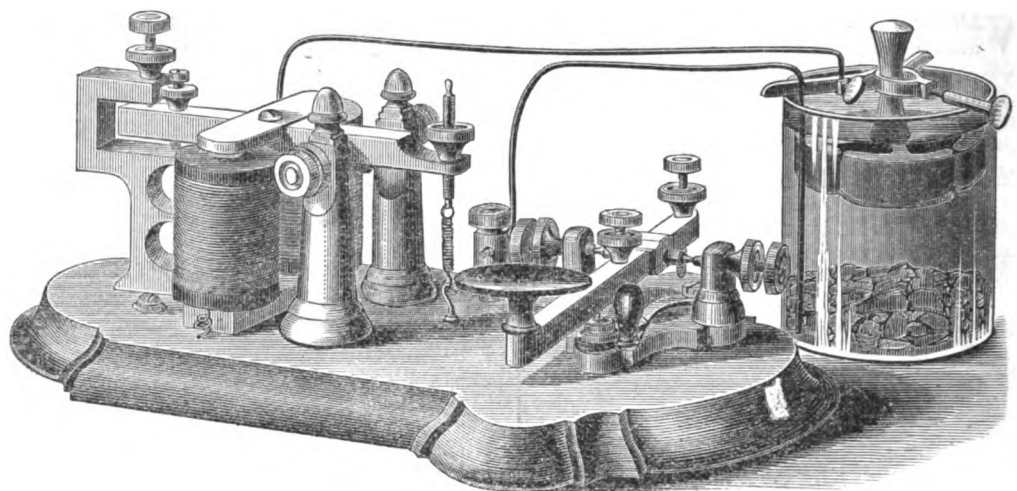
NO LOCAL REQUIRED.

Well seasoned black walnut box, large enough for pencils, paper, pliers and office wire, in addition to the instrument, \$4. Larger size for climbers, vices, &c., \$5.

RELAYS, SOUNDERS AND KEYS,

always on hand, plain or plated.

Our Challenge Sounder is the noisiest instrument made.



PARTRICK, BUNNELL & CO.'S Champion Learners' Instruments.

COMBINED No. 1 SOUNDER AND KEY, with
BATTERY, OFFICE WIRE, CHEMICALS, and a thorough
BOOK of PRACTICAL INSTRUCTION in the Art of Telegraphy
Which latter gives all necessary directions for setting up the Battery and complete apparatus, and operating them for practicing or communicating purposes.

THIS IS WARRANTED TO BE, BEYOND ALL COMPARISON, THE BEST APPARATUS EVER OFFERED FOR THE
USE OF STUDENTS OF TELEGRAPHY.

Being excellent Morse instruments, substantially made and nicely finished, with nothing left out of their construction which pertains to a Complete Sounder and Key Combination Set. Nothing made in miniature, or in awkward and unusual shape, as is done with the very cheap affairs usually offered as Learners' Apparatus. They are equally well suited

For TELEGRAPHIC SCHOOLS OF INSTRUCTION,

For PRIVATE TELEGRAPH LINES, and

For CITY WIRES OF TELEGRAPH COMPANIES.

The BATTERY which accompanies the Learners' Outfit is a full-sized Calland, the same as the best cells used by Telegraph Companies for main battery, and gives sufficient power to produce a loud, clear sound from the instrument, the Sounder of which embodies the same remarkable principles of sound which have made our "Giant Sounders" so famous and popular among telegraphers.

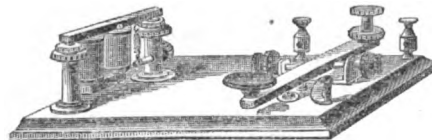
The BOOK OF INSTRUCTION is a clear and practical explanation, by an experienced telegrapher, of every fact and principle of modern telegraphy and its apparatus which a student of the art could possibly require to obtain, in undertaking to become an accomplished sound operator.

PRICE OF APPARATUS complete, with Book of Instructions, Battery, Wire, and all necessary materials for one complete office outfit, ready for shipment, \$10, sent by Express, C. O. D.; or \$9.50, if money order for that amount be sent in advance. The latter plan will additionally save the purchaser the Express charges for returning money.

PARTRICK, BUNNELL & CO.,

88 South Fourth Street, Philadelphia.

TILLOTSON'S EXCELSIOR Telegraph Instrument.



(PATENT APPLIED FOR.)

This apparatus is constructed of the best material, and finished equal to any Telegraph Instrument, and is warranted first-class in every particular. It is especially adapted to the requirements of Students of Telegraphy and the operation of Private Telegraph Lines.

Price, complete, Sounder and Key mounted on finely finished, Mahogany Base, with one Cell Hill's Patent Battery, with Chemicals, eight feet of Office Wire, and "Smith's Manual of Telegraphy" \$7 50

Two sets 14 50

Price of Sounder and Key only 6 50

" " " with Cut-Out and Lightning

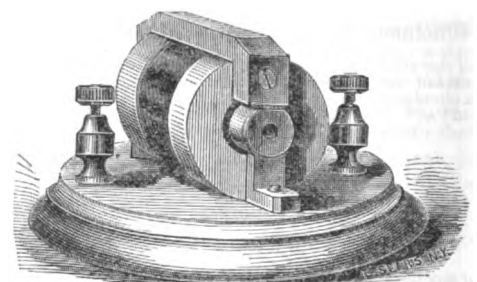
Arrester attached 7 50

END FOR CIRCULAR.

L. G. TILLOTSON & CO.

No. 8 DEY STREET, N. Y.

SOMETHING NEW. "The Rattler" Telegraph Sounder.



(PATENT APPLIED FOR.)

This is a very simple and effective Instrument, and, as it does not require any spring to draw the lever back, is always adjusted.

PRICE, - - - \$3.50.

L. G. TILLOTSON & CO.,

No. 8 DEY STREET, N. Y.

JOURNAL OF THE TELEGRAPH.

VOL. VII. NO. 2.

NEW YORK, JANUARY 15, 1874.

WHOLE NO. 149.

THE ENGLISH TELEGRAPHS.

The apparatus employed upon the English lines embraces almost every form which has ever been practically used, but the bulk of the traffic is performed with the Morse ink writer, the greater part of which are worked in connection with the double current key and Siemens' polarized relay. The speed of these instruments depends mainly upon the skill of the operators who work them, being generally about the same as that of the Morse recording apparatus employed upon our own lines. The speed of the Bright's bell apparatus is about the same as that of the Morse sounder, depending, like the latter, upon the skill and experience of the operators. I timed the operator at Edinburgh, and found him receiving by the bells at the rate of 32 words per minute.

The Hughes type printing instruments are only used to a limited extent in England, and the speed attained is not much in excess of the Morse sounder. The instruments are carried by weights, and the type-wheels make about 120 revolutions per minute, or a little more than half the speed of the Phelps combination instrument.

Wheatstone's automatic instruments are employed upon 33 message circuits, varying in length from 159 to 515 miles each, and upon six news circuits varying in length from 166 to 475 miles each, making a total of about 11,000 miles.

The speed of these instruments varies from 88 words per minute upon the London and Cork circuit, to 120 words per minute upon the London and Liverpool circuit. The average speed of the apparatus is about 70 words per minute, or about twice as fast as the speed of a first-class sound operator. The time occupied in the preparation of the messages for transmission depends somewhat upon the skill of the operator, but an expert clerk will easily prepare them at the rate of 25 words per minute. The automatic system, as compared with the Morse, requires rather more than double the number of clerks to do a given amount of business, and, therefore, for distances less than 200 miles, it is cheaper to put up additional wires than to make use of it.

The automatic system finds its most appreciative use in forwarding press messages, which are transmitted over several circuits in succession with only one preparation.

The single-needle instrument, of which there are over three thousand employed on the English lines, is one of the simplest forms of telegraph apparatus in use, being simply a combination of a vertical galvanometer or galvanoscope, and a current-revers-

ing key. Figure 1 represents the exterior of the instrument. In the center of the face is suspended the index, or pointer, attached to the magnet, which can deflect only a short distance to the right or left of its zero, on account of the stops. The alphabet is formed by movements of the needle or pointer to the right or left. A turn of the top point of the needle to the left indicates a dot, a turn to the right a dash. Thus A is made by a movement to the left and one to the right; H by four movements to the left. Formerly the single-needle instrument was operated by the movements of a vertical handle, the right or left movements of which sent currents of different polarities, but this has been superseded by a current-reversing key. The interior of the apparatus consists of two helices of fine silk covered copper wire, in the middle of which is suspended a small magnetic needle, having at the end of its axis

to the right. The needle *S N*, and pointer *a b*, are shown in Figure 3.

The alphabet used in England upon the Morse ink-writer and sounder, the single needle, Bright's bell, and the cable instruments, contains precisely the same combinations, but differently expressed; thus, upon the Morse ink-writer the letter E is represented by a dot; upon the sounder by a short click; upon the single needle by a movement of the pointer to the left; upon the bell by a stroke on the left bell; and upon the cable instrument by a spot of light to the left of the zero mark on the scale. The letter T is represented on the Morse recorder by a short line; on the sounder by a longer sound than that required for a dot; on the single needle by a movement of the pointer to the right; on the bell by a stroke on the right bell; and on the cable instrument by a spot of light to the right of the zero mark on the scale.

The management of the Traffic Department of the Post-Office Telegraphs is mainly performed by the permanent officials of the Post-Office, while the construction and maintenance of the lines and apparatus devolves upon the Engineering Department, which is composed of experienced telegraphists, formerly connected with the various lines purchased by the Government.

The permanent force attached to the Engineering Department, and rate of compensation, are as follows:

	Cost per Annum.		
	£	s.	d.
1 Engineer-in-Chief.....	1,300	0	0
1 Assistant do.	850	0	0
7 Divisional Engineers.....	4,589	19	3
1 Submarine Superintendent.....	463	1	1
2 Superintending Engineers.....	991	2	2
8 Superintendents, First Class....	2,080	8	5
25 Superintendents, Second Class..	5,550	17	7
2 Superintendents, Upper Section.	263	5	10
4 Superintendents, Lower Section.	823	0	1
20 Inspectors, First Class.....	2,851	14	8
69 Inspectors, Second Class.....	6,887	7	2
16 Inspectors	2,146	1	7
2 Junior Inspectors.....	140	0	0
107 Clerks.....	10,484	14	6
357 Mechanics and Linemen.....	23,196	5	10
6 Messengers	242	8	8
28 Employés at Factories.....	2,933	3	10
Rents for Factories and Store-houses.....	2,843	19	0

The performance of the telegraphic traffic in the United Kingdom is divided into five classes, viz:

The business carried on at the railway stations by railway companies.

Receiving offices and post-offices in town and country in which the receivers or postmasters provide for the work.



Figure 3.

Post-offices in the country in which the work is wholly or partly provided by the Department. The Central Telegraph Station in London.

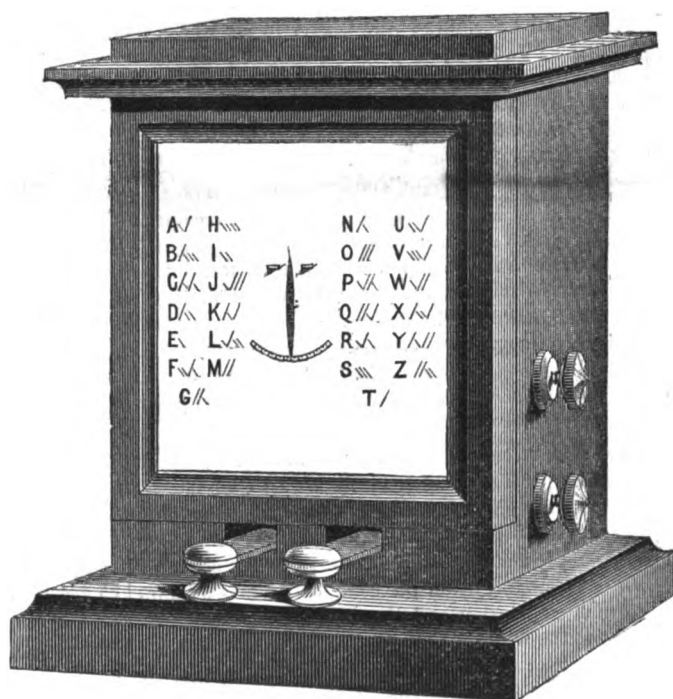


Figure 1.

a pointer seen on the outside face of the instrument. There is also a current-changing key, the two knobs of which protrude through the front of the instrument near the base. The key is represented in Figure 2. *L* and *E* are two levers connected respectively with the line and with earth. When they are not depressed they both press against the upper bar *C*, which is connected with the positive pole of the battery. Either lever can be depressed so as to come in contact with the bar *Z*, which is connected with the negative pole of the battery. If *L* is depressed a negative current flows into the line, and if *E* is depressed a positive current flows into the line. The receiving instrument at the other end of the line is so constructed that the depression of the left hand key causes a deflection of the pointer to the left; a depression of the right hand key a deflection

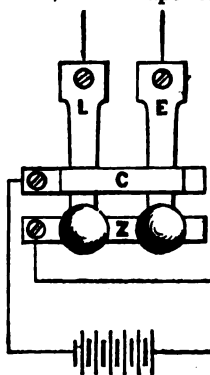


Figure 2.

District and branch offices in London.

The commissions paid to the railway companies are as follows:

For each public message despatched over the telegraphs of the company, or by the company's servants over the Government wires, or both, 3d.

For each public message received over the telegraphs of the company, and delivered by them, free of charge to the addressee within one mile of their telegraph stations, 3d.

It is estimated that the Department will pay to railway companies for forwarding, transmitting, and receiving messages on the above basis, about £20,000 per annum, or £11 per station; and that the messages forwarded from these offices will amount to about 7 per cent. of the whole traffic.

There are 2,783 offices in which the postmasters themselves provide for the work, the commissions or allowances for which vary from three shillings to two pounds twelve shillings per week, the average being ten shillings.

For this sum the postmaster has to provide a space on his counter, or in some other convenient part of his shop or office, for a slab or desk which can be screened from the observation of bystanders, and on which the public can write their messages; a place for the instrument and batteries; an operator to work the instrument during at least twelve hours daily, on week days, and one or two hours on Sundays; and a messenger to promptly deliver the messages received.

At about four-fifths of the above-mentioned offices the Single Needle instrument is used, and at the remainder the A B C. Neither of these instruments is employed to any considerable extent at the more important offices, and hence the value of this large number of rural stations as schools of instruction for supplying operators for the larger offices is entirely lost. As the superiority of the Morse apparatus over the needle instrument is everywhere conceded, and as it is almost exclusively used upon the most busy and important circuits, it is difficult to conceive why the needle instrument should be retained in the service.

The next class of offices consists of 384 post-offices and 72 railway stations, at which the Department provides for the work, employing for this purpose 3,189 officers and clerks, and 2,054 messengers, at an annual cost of £236,512, or about 17s. 4d. a week per head. Of this amount, the postmasters receive £7,216 14s., or about six shillings a week per head.

The allowances to head postmasters for personal responsibility, work, and supervision, depends partly upon the number of circuits working out of their offices, and partly upon the number of messages forwarded. For each of the first five circuits, £2 per annum is paid; for each of the next five, £1 10s.; and for each additional circuit above 10, £1 per annum.

The payment per message is at the rate of one farthing for each forwarded message. A minimum and maximum limit has been fixed, within which the above scale shall take effect, by which the remuneration to a head postmaster cannot be less than £10, nor more than £50, except by special arrangement.

The employés at the above mentioned offices are entitled to the following annual vacations:

1. For superintending officers, one month.
2. For operators who are liable for night and Sunday duty, three weeks.
4. For male or female clerks who are not liable for night or Sunday duty, two weeks.
4. For messengers, two weeks.

The Central Telegraph Station in London was, until quite recently, situated in Telegraph street, a

small street opening out of Moorgate street, at a distance of about half a mile from the General Post-Office. The building consists of a main body and two wings, and has three stories besides the ground floor and basement. The second and third floors were used for the receipt and transmission of messages. The first floor for offices of the Engineering Staff and Controller of the Station, and for a dining-room and kitchen for the female staff, and a sitting-room for the matron. On the ground floor were situated the delivery room, messengers' dining-room, inspectors' office, dining-rooms of the male staff, writing room for the press, consulting room for the medical officer, and a room for the intelligence department and for the engineers' workshops. The basement was devoted to the engines, batteries and stores.

On the first of January, the Central Telegraph Station was removed to a new and handsome edifice which has been for some time in course of construction for postal and telegraph purposes, situated opposite the General Post-Office in St. Martins-le-Grand. The exterior of the new building is solid and handsome, presenting a façade on St. Martins-le-Grand ornamented with columns and cornices and mouldings in the most effective style of modern decorative art. The material used in its construction is granite as high as the ground floor, and above that Portland stone. The building is 300 feet long by 90 feet wide, and forms a parallelogram, pierced with two central courts from which is obtained a good supply of light.

The whole upper floor is occupied by the Central Telegraph Office, and is the largest in the world, its area being 20,000 square feet. The room contains 800 instruments and two-thirds of a mile of mahogany tables. The new offices will cost altogether, when completed, about £450,000, of which £300,000 was paid for the site.

The Central Telegraph Office is mainly a repeating station, its chief business consisting in the receipt of messages for re-transmission. It receives some messages for delivery within a certain area, and during the night it is open for the collection of messages from the public. The Central Office is open night and day throughout the year, and has direct communication with 441 stations, 35 of which are also open day and night. It has 409 wire circuits, and 18 pneumatic tubes.

Of the messages which pass through it, about nineteen per cent. come in by wire to go out by tube or hand; about twenty-five per cent. come in by tube or hand to go out again by wire; and about fifty-six per cent. come in by wire to go out again by wire. Thus forty-four per cent. of its messages involve one operation, and fifty-six per cent. two operations of the wire for each message.

The working force at the Central Station, including the Manager and his assistants, but exclusive of messengers, consists of 1,243 operators and clerks, 733 of whom are females. The rate of compensation ranges from £675 per year for the Manager, to 8s. per week for the lowest class operators.

In the operating department of the Central Station the wages paid are as follows:

MALE STAFF.		Per Annum.
Principal Superintendents for Night duty, from...	£22.0	to £30.0
Operators in charge of divisions for Night duty, from...	150	to 200
Senior Operators	140	to 160
First-Class Operators.....	100	to 130
Second "	70	to 90
Third "	45	to 65
Probationary	30	to 40

The average annual compensation paid to male employés of the London office is \$330 each.

FEMALE STAFF.

Principal Operators.....	£120	to £180
Operators in charge of Division from.....	70	to 120
First-Class Operators.....	65	to 80
Second "	45	to 65
Third "	35	to 45
Probationary.....	20	to 30

The probationary operators enter at 8s. per week for females, and 12s. for males, on receiving a certificate from the school of instruction in telegraphy; and their weekly pay is advanced to 12s. for females and 14s. for males when the manager certifies to their ability to transmit public messages; and to 14s. for females and 16s. for males on being certified by him as being capable of taking charge of a circuit. The annual compensation paid to female employés in the London office averages \$198 each.

Counting the repeated messages twice, that is, as both received and sent, the number of messages passing daily through the Central Station is about 35,000, being an average of about 28 messages per day for each employé.

This rate is rather above the average in the United Kingdom. Birmingham has 147 operators and clerks, and handles 3,984 messages per day, being at the rate of about 27 per employé.

Liverpool has 250 operators and clerks, and handles 8,154 messages per day, averaging about 32 per employé.

Manchester has 268 operators and clerks, and handles 8,016 messages per day, being at the rate of about 30 per employé.

Newcastle-on-Tyne has 136 operators and clerks, and handles 3,552 messages per day, being at the rate of 26 per employé.

Belfast has 110 operators and clerks, and handles 2,271 messages per day, being at the rate of about 20 per employé.

Cork has 72 operators and clerks, and handles 1,392 messages per day, being at the rate of about 19 per employé.

Dublin has 401 operators and clerks, and handles 3,634 messages per day, being at the rate of about 9 per employé.

Limerick has 31 operators and clerks, and handles 413 messages per day, being at the rate of about 14 per employé.

Edinburgh has 153 operators and clerks, and handles 4,311 messages per day, being at the rate of about 28 per employé.

Glasgow has 167 operators and clerks, and handles 6,298 messages per day, being at the rate of about 37 per employé.

Thus it will be seen that at eleven of the principal stations in the United Kingdom the average number of messages received or sent, per employé, is about 25 per day.

(To be continued.)

WASTE NO TIME.—After allowing yourself proper time for rest, don't live a single hour of your life without doing exactly what is to be done in it, and going straight through it from beginning to end. Work, play, study, whatever it is, take hold at once and finish it up squarely and clearly; then to the next thing, without letting any moments drop out between. It is wonderful to see how many hours these prompt people contrive to make of a day; it is as if they picked up the moments that the dawdlers lost. And if ever you find yourself where you have so many things pressed upon you that you hardly know where to begin, let us tell you a secret. Take hold of the very first one that comes to hand, and you will find the rest all fall into file, and follow after, like a company of well drilled soldiers; and though work may be hard to meet when it charges in a squad, it is easily vanquished if you can bring it into line.

THE POSTAL TELEGRAPH.

PRIVATE MANAGEMENT BETTER THAN PUBLIC.

A LETTER FROM PRESIDENT ORTON TO THE POSTMASTER-GENERAL, REVIEWING THE RECOMMENDATIONS OF HIS ANNUAL REPORT.

(Continued from page 4.)

EXTORTION!

It is doubtless true, as stated in the report, that in the near future the entire methods and machinery of telegraphic communication will be cheapened; but, being true, why it should follow "that the Government will be compelled to assume their control in order to protect the people from extortion" does not clearly appear. "Extortion" is a word of severe import, and should not be lightly used. As here applied, without evidence to justify it, it will, when calmly considered by a discriminating public, recoil with more damaging effect upon the high official who hurls it than upon the private citizen at whom it is aimed.

The next statement in the report which seems to deserve notice is the following:

"There are now but two parties in the controversy over the postal telegraph—on one side the people, on the other the Western Union Telegraph Company."

This is followed by a long extract from the last annual report of the President of that Company, after which the Postmaster-General proceeds with the following "elegant extract":

"The Western Union Company has always contended for high rates, and enforced them with a strong hand. When new associations have been formed for the purpose of reducing rates, the Western Union has at once entered the lists to destroy its rivals, and, in pursuit of victory, has not scrupled to use any device which the powerful can employ against the weak. *Failing to vanquish its adversary in the open field of fair competition, it has resorted to artifice, and triumphed by making gold its weapon.*"

The Postmaster-General concludes this indictment of the Western Union Company for high crimes and misdemeanors by saying of the Western Union report that it evinces

"A settled purpose to reduce rates only that it might exterminate competing companies already organized, or which it feared would be organized."

It was stated early in the report that the opposition to the postal telegraph came from the telegraph companies (in the plural) and those directly interested with them in sustaining their monopoly. Further reflection appears to have induced the Postmaster-General to modify this opinion—to suspend sentence upon all parties except the Western Union—and to concentrate upon that company and its officers the entire weight of his condemnation.

Reply has already been made to the claim that any considerable number of our people desire the postal telegraph.

The expenses of the Post-Office Department are in excess of its receipts by \$6,000,000 a year, not including interest on the millions which have been and are now being expended in the erection of buildings for the convenience of its operations. The telegraph may not always perform the business confided to it satisfactorily, but indications are not wanting in the report that the same is true of the Post-Office. The former has been little if at all behind the latter in conforming to the public requirements. It is a notable fact that the principal complaint of the inefficiency of the telegraph comes from a high official of the Government, who announces his purpose to bring its business, influence and patronage under the control of his department. In his efforts to that end he has encountered no denial of the right of the Government to take the property on the payment of its value, to be determined in the manner provided by law. He is mistaken, however, in assuming that the only opposition comes from the Western Union Company. What they oppose is not his right to control, although doubting its expediency, but they have protested and will continue to protest earnestly against misrepresentations, from whatever source, as to the value of their property, and unjust aspersions of the character of their managers. The charge that "they have always contended for high rates and enforced them with a strong hand" can be properly met with but one answer: It is not true. Telegraph rates in the United States are now but half what they were six years ago, and the majority of the reductions made by the Western Union Company have been made voluntarily, without compulsion, and for reasons and purposes alike lawful and honorable. In the rivalry with new associations they have made efforts to retain former customers and to secure new ones by endeavoring to do the business more promptly and satisfactorily than their competitors. In no case have they been the first to reduce rates upon competing routes. In fact, the report of the Postmaster-General admits this when speaking of associations "formed for the purpose of reducing rates." Does he expect the Western Union to maintain higher rates than its "rivals," in order that the former and not the latter may be "destroyed." We have repeatedly remonstrated against what we believed to be unreasonable reductions, but when compelled to reduce, by the action of our competitors, we have not always permitted them to dictate the rates. If our rivals had been vanquished it was either because they did not possess the facilities requisite for doing sufficient business to enable them to pay its ex-

penses, or because the rates they insisted upon establishing proved to be unremunerative, or because they failed to conduct their business to the satisfaction of the public.

The charge that the Western Union Company "have not scrupled to use any device which the powerful can employ against the weak, and failing in the open field of fair competition, have resorted to artifice, and have triumphed by making gold their weapon," is absolutely groundless, and if uttered by one less distinguished than the Postmaster-General would deserve to be characterized as a pompous slander. If published by one private individual in respect to another, it would make its author liable to an action for damages.

It is true that we are ready to purchase telegraph lines required to meet the demands of a constantly increasing business whenever we can do so on terms that are deemed satisfactory. But there are always two parties to such transactions—the buyer and the seller—and neither can accomplish his purpose without the assent of the other. It has rarely happened in the purchase of telegraph lines that we could not have acquired them on better terms by waiting longer. But if the owners of private property desire to sell it, and parties can be found able and willing to buy, what has the Postmaster-General to do with the transaction, whether the buyer or the seller makes the better bargain? Who has addressed to him a complaint that the Western Union Company has obtained control of any property by dishonorable means?

ELEMENTARY AND RUDIMENTARY.

The report of the Postmaster-General proceeds to state some elementary truths:

"Nature furnishes an inexhaustible storehouse of electricity. The earth and the atmosphere constitute the never wearying media of its transmission. * * * As well might a charter be granted for the exclusive use of air, light, or water; as well might a price be set on the winds and waves, or rivers flowing to the sea, the seed time and harvest, and on the power which causes the seeds to germinate and the fruits of the earth to grow, as to restrict for the sake of profit the use of electricity—that most subtle and universal of God's mysterious agents."

The Western Union Company is not in exclusive possession of all the electricity in the country, nor does it enjoy special privileges in any State, except the right to use certain valuable patents which are protected by law. It has a right to acquire a monopoly of the telegraph business by serving the public better and cheaper than other parties are able or willing to serve it. But if it be true, as stated in the report, that its competitors have been "vanquished" by the reduction of rates, does not that fact destroy the chief support on which the postal telegraph scheme rests? If private companies cannot pay expenses at present rates, how is it expected that the Government can make a profit at still lower rates?

OFFICIAL INEFFICIENCY.

Has our Government, or that of any of the States, ever opened a turnpike, dug a canal, constructed a railroad, built a ship, erected a building, or managed any business more efficiently or economically than private parties would have done? Is it not an admitted fact that, as compared with private enterprise, all Government work is in a greater or less degree dilatory, wasteful, and extravagant? And is it possible to produce a different result under an elective system? No civil service rules touching character and competency, however faithfully administered by men indebted for their own positions to personal and political favor, will ever be as successful in securing the fittest agents to have charge of intricate and delicate business operations as that instinct of self-interest which governs men in the conduct of their private affairs.

STATISTICS VERSUS ESTIMATES.

The Postmaster-General next proceeds to give sundry financial items taken from the Western Union report. The figures which he presents show that of the net profits of the Company, which amounted to \$20,312,618 during the last seven years, more than \$13,000,000 are represented by new property acquired during that time, and by assets now on hand. I refer to these statements only for the purpose of contrasting them with the estimate made by the Postmaster-General one year ago, and concerning the correctness of which he now expresses "full confidence," that the property of the Western Union and all the other telegraph companies in the United States could be reproduced for \$11,940,000! The report which characterizes the Western Union figures as an "admirable exposition," proceeds to say:

"A CURIOUS PUBLIC."

"It is to be regretted that there had not been placed by the side of it, for the gratification of a curious public, an equally lucid statement of the amount of cash capital paid in by the stockholders of the Western Union Company, and of the companies out of which it has been compounded."

The Western Union report was written for the information of the stockholders of that Company, and not "for the gratification of a curious public." If it had occurred to its author that a Government official would have the leisure and disposition to occupy himself with a criticism of its details, to be embodied in a public document, perhaps some pains would have been taken to supply material for the gratification of such eminent curiosity. This bit of dignified pleasantry is succeeded by the following

OFFICIAL PERSONALITIES.

"Elated as he must have been by a contemplation of the manner in which the net profits had swept away all opposition, present or prospective, President Orton might well say, in the language quoted from his report, that 'the time is not distant when the Western Union Company will be without a substan-

tial competitor in the conduct of a business which, notwithstanding the enormous growth of the last seven years, is still in its infancy."

This is followed by what purports to be an extract from the Western Union report, which its President did not write, which was not read at the annual meeting of stockholders, and the publication of which in a newspaper was unintentional. It did not appear in the official copy of the report in THE JOURNAL OF THE TELEGRAPH, to which the Postmaster-General is a subscriber.

When a Cabinet Minister attacks a private citizen who sustains no relation, business or otherwise, to his Department, and swaps the dignity of an official report for an opportunity to excite ridicule, comment would be a waste of words.

The Postmaster-General concludes as follows:

SELL OUT OR BE CRUSHED OUT.

"The telegraph should be made a part of the postal system without further delay. As Congress does not seem inclined to exercise the discretion given in the third section of the Act of July 24, 1866, to appoint appraisers to value the 'lines, property, and effects' of the companies now in operation, and as the Western Union Company appears to be unwilling to make a voluntary sale at a fair price, I recommend that provision be made by law for the immediate establishment of the postal telegraph, and for the construction of all such lines as may be needed, under the direction of competent officers of the Engineer Corps of the Army."

In his report one year ago, after urging Congress to inaugurate the postal telegraph by acquiring "the lines of some or all" of the present companies, the same official recommends: First, that instead of adopting the Hubbard or partnership scheme, the telegraph "should be put entirely into the hands of the Government." But, second, if it is decided that the public interest does not demand the postal telegraph, "then the Government should not favor one private company to the exclusion of another, nor should it in anywise enter into competition with private enterprise."

I shall not attempt to reconcile or explain the direct conflict between these two recommendations. The neglect of Congress to take action at the last session upon the recommendation made a year ago is an indication that, in their opinion, the public interest does not require the postal telegraph. Therefore, there was no occasion to exercise the discretion given in the Act of July 24, 1866, to appoint appraisers to value "the lines, property," and effects of the telegraph companies. There is no authority for the statement that the Western Union Company "appears to be unwilling to make a voluntary sale at a fair price." That company has accepted the terms of the Act of 1866, and will comply with those terms by selling their property to the Government whenever Congress gives notice of the desire to buy, and requests the appointment of "competent, disinterested persons" to assist in the valuation. The valuation, as fixed in the manner prescribed by that Act, will be accepted by the company as "a fair price." No officer of the Government has been authorized to ask the company to name the price which they are willing to accept, nor has any such officer authority to purchase the company's property, however satisfactory the price might be at which they should offer to sell. It may be safely assumed that, under existing laws, the managers of the company will not be willing to make a private bargain with the Postmaster-General for the sale of their lines; nor do they believe that the country will ever be satisfied to inaugurate the postal telegraph in that way.

TAXING CITIZENS TO PAY THE COST OF DESTROYING THEIR PROPERTY.

There only remains to be considered the recommendation of the Postmaster-General, that Congress authorize the construction of lines required for the immediate establishment of the postal telegraph. Can it be that the Postmaster-General expected a proposition to be seriously considered which contemplates employing public moneys, collected from the people by taxation, to set up the Government in business as the competitor of private citizens? Coming from an executive officer of a Republican Government, whose powers are defined and limited by a constitution and laws, the proposal is simply monstrous. If there were no such prohibition in the Constitution, the common sense of an intelligent people would revolt at the suggestion that private property should be taken for public use without just compensation.* But to use public moneys to destroy private property by governmental competition would be more unjust than to take it without compensation. In the latter case its owners would lose only its value, while in the former they would make the same loss, and in addition thereto be obliged to contribute in taxes their pro rata share of the cost of its destruction. The owners of telegraph property, startled as they may well be at this most extraordinary proposal, need have no apprehension of its being carried into effect. The people of the United States are intelligent and just, and the Congress they have chosen, faithfully representing them, will require the Government to show the same respect for private property and private rights that the common law requires each citizen to show to every other. I have the honor to be, Sir, very respectfully, your obedient servant,

WILLIAM ORTON.

APPENDIX A.

The Postmaster-General proposes to destroy all telegraph property in the country by putting the United States in the field as a competitor, supported by the public treasury.

* Appendix A.

When, if ever, this proposition is seriously considered by Congress, some grave questions will arise involving moral obligations of the Government to the citizen and the limitations of constitutional power.

It is not my purpose to suggest in any complete manner the nature of these questions as affecting either the power of the Government to deal with the subject of the telegraph at all (otherwise than has been already done), or, having such power, in exercising it to take or destroy private property without compensation or due process of law.

The judicial language in a few cases cited below, will suggest the light in which the project is likely to be received by the courts.

"It would be a very curious and unsatisfactory result if, in constraining a provision of constitutional law, always understood to have been adopted for protection and security to the rights of the individual as against the Government, and which has received the commendation of jurists, statesmen, and commentators as placing the just principles of common law on that subject beyond the power of ordinary legislation to change or control them, it shall be held that if the Government refrains from the absolute conversion of real property to the uses of the public, it can destroy its value entirely, can inflict irreparable and permanent injury to any extent, can, in effect, subject it to total destruction without making any compensation, because, in the narrow sense of that word, it is not *taken* for the public use. Such a construction would pervert the constitutional provision into a restriction upon the rights of the citizen, as those rights stood at the common law, instead of the Government, and make it an authority for invasion of private right under the pretext of the public good, which had no warrant in the laws or practices of our ancestors."—[Pumpelly agt. Green Bay Company, 13 Wallace's Rep., pp. 177, 178.]

"Can the Legislature have power to do that indirectly which it cannot do directly? If it cannot take away or resume the franchise itself, can it take away its whole substance and value? If the law will create an implication that the Legislature shall not resume its own grant, is it not equally as natural and as necessary an implication that the Legislature shall not do any act directly to prejudice its own grant, or to destroy its value? If there were no authority in favor of so reasonable a doctrine, I would say, in the language of the late lamented Mr. Chief Justice Parker, in this very case: 'I ground it on the principles of our Government and Constitution, and on the immutable principles of justice, which ought to bind governments as well as people.'"—[Story, J., Charles River Bridge agt. Warren Bridge et al., 11 Peters's Rep., 617.*]

"If it had been proposed to pass an act for the sequestration of the toll of Charles River bridge to an amount not exceeding \$60,000, to build a bridge for the use of the Commonwealth where the Warren bridge has been built, it is not believed that any member of the Legislature would have voted for it. A sense of justice would have prevented the adoption of a measure so iniquitous and oppressive upon its front. But what is the difference between a sequestration of the money actually in the plaintiff's treasury, and an act to prevent that amount from going into their treasury? I ask what difference is there in effect of the one and of the other upon the plaintiff's interest? The difference is in form only, not in substance."—[Charles River Bridge agt. Warren Bridge, 7 Pickering's Rep. p. 508.]

"When a law annihilates the value of property, and strips it of its attributes, by which alone it is distinguished as property, the owner is deprived of it according to the plainest interpretation, and certainly within the spirit of a constitutional provision intended expressly to shield private rights from the exercise of arbitrary power."—[Wynehamer agt. The People, 3 Kernan, 386.]

"Even if, upon a fair construction of the grant, the power conferred is broad enough to protect the company against all the consequential injuries to private interests, and was so intended by the Legislature, it would be impossible to uphold it to this extent, where no provision has been made for full compensation. It would be in violation of the fundamental law of the land."—[The People agt. Gray, 25 Wendell's Rept., 464.]

"A proper construction of the word '*taken*' makes it synonymous with seized, injured, destroyed, deprived of. It is, therefore, evident that the Legislature have no power to authorize, in any case, either a direct or consequential injury to private property without compensation to the owner."—[Evansville Co. agt. Dick, 9 Indiana, 433.]

"In the extension of the National road through the State of Ohio a free bridge was thrown across a stream by the side of a toll bridge, which had some ten or fifteen years of its charter to run. The new bridge did not in the least obstruct the passage over the old one; and it was contended that as no exclusive right was given under the first grant, the owner of the toll bridge was entitled to no compensation. It was said on that occasion, as it has been argued on this, that the right was given subject to the discretion of the Legislature, as to a subsequent grant; and that the new bridge could not be objected to by the first grantee, whether it was built under the authority of the State or Federal Government.

"This course of reasoning influenced a decision against the claimant in the first instance, but a reconsideration of his case, and a more thorough investigation of it, induced the proper authority to reverse the decision and award an indemnity for the injury done. The value of the charter was estimated, and a just compensation was made. This, it is true, was not a judicial decision, but it was a decision of the high functionaries of the Government, and is entitled to respect. It was dictated by that sense of justice which should be felt on the bench and by every tribunal having the power to act upon private rights."—[11 Peters's R., p. 568.]

* Although Judge Story's opinion in this case was overruled by a bare majority of the Court, it was submitted to the State Legislature, and an act was subsequently passed by that body, indemnifying the stockholders of the Bridge Company, the value of whose franchise had been thus indirectly destroyed under the forms of law.—[Private Laws of Mass., vol. 8, A. D. 1841, ch. 88.]

APPENDIX B.

THE AUTOMATIC TELEGRAPH.

After the letter to the Postmaster-General was put in type, I received information that a series of experiments in transmitting the President's Message had been made by the automatic process, and that on one occasion these experiments had been conducted in the presence of the Postmaster-General and other eminent persons. It was represented that in the earlier experiments the time required to transmit the message between Washington and New York was 34 minutes, but that subsequently the transmission was accomplished in 22 minutes.

I will assume not only that these statements are correct, but will go further and admit, for the purpose of this illustration, that the transmission can be successfully made in telegraphic characters, plainly legible, in 20 minutes.

The President's Message, the Spanish Protocol, and a digest of the Treasury Report, aggregating 11,640 words, were transmitted by the Western Union Company from Washington to New York, on eight wires, and six copies taken, in an average of 60 minutes. But for a misunderstanding which resulted in a brief interruption of one of the wires, the transmission would have been completed in a few minutes less time. To work these eight wires required eight sending operators at Washington and eight receiving operators at New York. By the Western Union or Morse process the acts of sending and receiving are simultaneous; and when all the matter had been sent it was all received, written out and ready for delivery. But the automatic system involves three separate and distinct processes:

First: The messages must be translated into telegraphic language, by perforations in strips of paper, which correspond to the dots and dashes of the Morse alphabet.

Second: The perforated paper must be wound upon a reel and then made to pass rapidly under a steel comb, the teeth of which dropping through the perforations establish electrical connection with the receiving instrument at the other end of the circuit, where the electric current, acting upon chemically prepared paper, reproduces the dots and dashes.

Third: The message, which is then in telegraphic characters, must be translated and copied.

The first requisite of the telegraph is speed, and no new process is entitled to consideration that will not perform ordinary telegraph work within the same time that it can be done by the process now in use. It will not do to say that the Western Union Company could do its work with a less number of wires if it had the automatic, or that the automatic can do the same work in longer time with fewer wires. The Western Union has the wires requisite to do all the work demanded, and the automatic cannot hope to compete successfully without doing its work with equal promptness.

The real question, then, in this case is, What does the automatic process involve in order to enable it to deliver the President's Message complete in New York within 60 minutes of its receipt at Washington?

I have assumed that its transmission could be accomplished in 20 minutes. Then the perforation at one end and the translation and copying at the other must both be accomplished in 40 minutes, and it will not be unfair to divide the time equally, and give 20 minutes to each. Now, one Morse operator will send in an hour as many words as one operative can perforate in the same time. I am confident the former can do 25 per cent. more than the latter. If it took eight operators one hour to send the message, allowing the same time to perforate it, it would require three times eight, equal to 24, operators to perforate it in one-third of an hour. Assuming that the transmission is accomplished without accident in 20 minutes, and that it is plainly legible, we have now consumed 40 minutes, and the message is still a confused mass of paper tape, on which are telegraphic characters, and there remain 20 minutes in which to translate and copy. It can be readily demonstrated that an operator will not translate and copy from the paper tape more than half as fast as when receiving by sound. Assuming this to be true—and the only doubt I have is whether the copying capacity is not over-estimated—it would take twice as many translators and copyists to perform the work in 20 minutes as it did perforators—that is, 48. So, then, it would require 24 perforators, 48 copyists, and at least three more to attend the transmitting and receiving instruments and the perforators, making a force of 75 to accomplish in an hour the work performed with 16 operators on eight wires by the Western Union in the same time. I have before stated that it is the experience of those connected with the British telegraph lines that five times as many operators are required to work the automatic process effectively as the Morse. Five times 16 are 80, or five more than my estimate in this instance, which is probably too low by at least five.

Whatever else the automatic may be able to do satisfactorily, it is very certain that it cannot handle press matter in the day time. It is immaterial whether it is more economical than other processes or not. The press of this country insist upon having the very latest news possible to be obtained up to the time of going to press, and they are willing to pay what it will cost to procure it by that process that will give it to them. But the automatic is not the most economical. It would be decid-

edly cheaper for the Western Union to provide and maintain seven additional wires between Washington and New York than to maintain such a force at both places as would render it possible to transmit and deliver by the automatic process 12,000 words within an hour from the time of filing without interfering materially with other business passing between the same places at the same time. It has sometimes been said that less skilled, and therefore less expensive labor, could be employed in the automatic process than is required under the Morse system. But this is entirely fallacious. The skill and experience required to perforate and to translate and copy promptly and accurately will be certain to command as high wages as are paid for other telegraphic work.

Of every dollar received by the Western Union Company we are obliged to disburse about 70 cents to pay for the cost of getting it. About 40 cents of the 70 are paid for labor. To double the cost of the labor alone would change the proportion of expenses to receipts from 70 and 100, as at present, to 110 and 100. It is not necessary to pursue the computation further, but it will be easy enough to show what the result would be if the cost of labor was multiplied by five.

Announcement was recently made in the English papers of what was there considered an extraordinary telegraphic feat in the transmission to the press of an address by John Bright to his constituents at Birmingham. Extensive preparations to report and telegraph the address were made in advance of its delivery. A special staff was sent out from the London office to re-enforce the regular staff at Birmingham, and the ordinary equipment was augmented by 12 Wheatstone's Automatic Transmitters, and 36 perforating machines, six of which were of extra power, capable of producing three perforated copies at one operation. This gave an equivalent of 48 ordinary perforators. It appears that with this immense array of machines, operated by 60 clerks, the British telegraph was able to transmit the speech of Mr. Bright direct to 21 cities, and indirectly an abridged report to six other places. The address was made in the evening, and all that was required of the telegraph was to transmit and deliver it in time for publication in the morning papers. This would give an average of five to six hours. I have no information as to the number of clerks required to translate and copy at the stations where it was delivered, but, judging by the number required to transmit, the copying force must have been very large.

The Western Union Company received the President's Message at the Washington office Dec. 2, at one o'clock p. m. As before stated, it was sent to New York on eight wires, and copies were dropped at Baltimore and Philadelphia. At New York six copies were taken, four for delivery to the press and two for use in retransmission. From New York it was sent to Boston and dropped at all the intermediate cities which take regular press reports, and also west to Buffalo and Chicago, with drops at intermediate stations. From Philadelphia it was sent to Pittsburgh, and West and South, with intermediate drops. From Chicago it was retransmitted to San Francisco and other Western points. At the same time that it was being sent from Washington to New York, Washington was sending it South and South-West, so that within three hours of its reception at the Washington station it had been transmitted to 60 other stations, and delivered to more than 100 newspapers scattered over an area of 2,000 miles in extent in one direction, and 4,000 miles in another. No such telegraphic performance is possible by any system in any other country.

I do not wish to be understood as desiring to make disparaging comparisons, nor as questioning the efficiency of the British telegraphs. They are most ably and efficiently managed. Money, energy, and diligence have been bestowed upon them without stint. They possess certain decided advantages over the American telegraphs. Their operations are conducted within a limited area and among a dense population. Materials of all kinds costs a third less there than here, and labor less than half as much. It would not be surprising, therefore, if under these favorable conditions their performance excelled ours. Such, however, is not the fact. The American telegraphs perform more work in the same time, and with less labor than those of any other country. The results of the following comparison between New York and London fairly represent the difference between all the other principal cities of the two countries.

At the Central Telegraph Station in London, the working force consists of 1,243 persons including the manager and his assistants, but exclusive of messengers. Counting repeated messages twice—that is, once when received and once when resent—the number of messages passing daily through that station is about 35,000, being an average of about 28 messages for each employee.

The working force of the Western Union Company's central office in New York is 234 persons, including the manager and assistants, but excluding messengers. The number of messages passing daily, counted as above, is about 25,000, being an average of 107 per day for each employé.

The annual compensation paid to male employés of the London office averages \$330 each, and to the female employés \$198 each. The average compensation paid to the male employés of the Western Union Company at their central office in New York is \$913 per annum, and of the females \$512 per annum.

In view of the facts herein stated, it is not probable that the automatic system will ever become a formidable rival of that employed with such satisfactory results by the telegraph companies in the United States. W. O.

FOREIGN TELEGRAPHIC ITEMS

WESTERN AND BRAZILIAN TELEGRAPH COMPANY.

At a general meeting of the Western and Brazilian Telegraph Company, lately held in London, the following very satisfactory statement of its affairs was made :

The line from Pernambuco to Pará has been laid, and, according to the last return, is working as well as when first laid. The steamship Hooper is now laying the southern portion from Pernambuco to Bahia, and from Bahia to Rio de Janeiro; and, according to our calculations, she ought to have completed it about the 1st or 2d of January, and may be expected home early in February. The further line connecting Rio de Janeiro with the River Plate we have purchased on certain terms, and we have paid the deposit money for the purchase; so that, as soon as these cables are laid (and we are told they will be ready in February), communication from Pará to the River Plate will be complete. For this we have paid all the money due to the contractors, as well as the shares due to the Platine-Braziliera Telegraph Company, which latter will be handed to that company as soon as the cables are delivered to us in working order. We have also bought a repairing ship, to be on the coast and look after the cables, and that vessel will be ready to go out from here in two or three months. In the meantime, we have arranged with our contractors for the use of their ship, the Great Northern, and she will sail on Saturday next for Pará, where she will remain to do anything required to the cables. The traffic manager, Mr. Hyde, has only just arrived out at Pernambuco; but we hear otherwise that advices will reach us by next mail of what the traffic is like, and, by all accounts, we expect to get a very satisfactory result indeed. As soon as the Hooper returns, the cables connecting Pará with the West India Companies, which is now ready, will be sent out; and we have arranged with the other parties in the West Indies to connect with their cable at Trinidad, so that we shall then have possession of the whole of the traffic between the Brazils and West Indies, as well as the Transatlantic lines to the United States. The Brazilian Submarine Telegraph Company, who have made arrangements with us to work direct to Europe, have been unsuccessful in laying their cable to Madeira, and therefore the probability is that we shall have the whole of the traffic for our own lines for some time. We have made all our money payments, and have some money at the bank; we owe no one anything; we expect that the traffic returns will equal the success we have had in laying the cables.

The London *Times* states that it may be some time before the nation learns the total cost of the purchase of the telegraphs by the State. The materials for calculation are, at present, £5,847,847 returned as paid to "Telegraph Companies;" £865,559 returned as paid, or due, to "Railway Companies" up to the 15th of July, 1878; and such proportion of the £5,000,000 said to be the amount of claims outstanding as may be eventually ascertained, by arbitration or otherwise, to be due.

Messrs. Hambro & Son announce the payment on the 1st of January of interest at the rate of 5 per cent. per annum on the shares of the Great Northern Telegraph Company.

The Eastern Telegraph Company's traffic receipts for the month of November, 1878, amounted to £35,096, against £38,667 in the corresponding period of 1872.

The Eastern Extension, etc., Telegraph Company state that the receipts of their lines for the month of November, 1878, amounted to £17,454, against £15,991 for the corresponding period of 1872 of the four separate lines, viz.: British India Extension, China Submarine, British-Australian, and Tasmanian Submarine Telegraph.

A MOVEMENT is on foot among the shareholders of the West India and Panama Telegraph Company to call an extraordinary meeting of the company for the purpose of taking into consideration the report of the committee, and reconstituting the Board. This step has been rendered necessary in their opinion by the fact of the directors declaring that they would use the proxies received by them before the date of the appointment of the committee in voting upon recommendations of the report.

The total number of messages forwarded from postal telegraph stations in the United Kingdom, during the week ended the 18th of December, 1878, was 838,742; and during the corresponding week of 1872, 291,117, showing an increase in the week of 1878 on that of 1872 of 47,625.

The Constituent Assembly of Panama has resolved that a branch of public instruction shall be established by which young men can learn telegraphing, and commends it to the Board of Public Instruction.

The telegraph ship Africa, after laying the 350 miles of cable between Alexandria and Brindisi, will proceed to lay a cable across the Straits of Messina.

The Peruvian Government has granted permission to Charles Scott to construct a sub-marine cable between Callao and some port in Chili.

The bill authorizing the laying of a telegraph cable between New Zealand and Australia has become a law.

PRIZES FOR SCIENTIFIC EXPERIMENTS.

The following subjects for prizes to be awarded in 1874, have been proposed by the Batavian Society of Philosophy :

1. To discover if there exists in the molecular state of bodies, modifications other than those caused by temperature, which are such as to give for the same body different spectra. The society wishes that this inquiry should bear chiefly on the magnetic condition of bodies.

2. To find out by new experiments if the vapor of water exercises on radiant heat an absorbent effect much more powerful than dry atmospheric air, as Mr. Tyndall maintains; or if there exists no difference in this respect between dry and moist air, as M. Magnus maintains. The society desires that the new experiments which it asks for be conclusive, and enable it to decide between the two opinions.

3. To determine what influence the pressure which is put upon an electrolyte has on electrolysis, and how far in this case is the principle of conservation of energy confirmed. It is wished that this inquiry bear on three liquids at least, to be chosen by the competitor.

4. To determine the resistance of the liquid amalgams of zinc and gold to the galvanic current. Six at least of each of these amalgams, in various proportions, ought to be examined.

5. A prize is proposed for new experiments which will enable a certain decision to be come to on the opinion, advanced by M. Gauguain as probable, namely, that voltaic electricity is propagated by matter, while induced electricity is propagated by ether.

OBITUARY.

PROF. A. DE LA RIVE.

The distinguished scientist and electrician, Prof. A. De la Rive, died at Marseilles, France, on the evening of November 27th, 1878.

The London *Times* in an able *mémoire* remarks that it is no doubt to his discoveries in the science of electricity that his great reputation is principally due. His researches in 1825 and 1826 on the chemical theory of the voltaic battery, and on the properties of magneto-electric currents, prepared the way to future discoveries. Electro-dynamics, magnetism, the relations of magnetism with dynamic electricity, the propagation of electricity through the interior of bodies, the nature and properties of the voltaic arc, and the consideration of the various sources from which electricity is derived, are subjects which have all successively occupied his attention. At a later period, De la Rive directed his mind more particularly to the phenomena which accompany the passage of electric currents through extremely rarified media. The results he obtained led him to a new theory on the cause of the aurora borealis; and, when this theory was contested by some, he demonstrated its plausibility by exhibiting before a select audience at Paris, composed principally of members of the Institute, a series of beautiful experiments, producing by artificial means the various principal phenomena which characterize the aurora. Besides these original researches, many of which we are obliged to omit, De la Rive published, between 1853 and 1858, a complete treatise on electricity and its recent wonderful applications, in three large octavo volumes, which, though not intended for a popular treatise, is comprehensible to all who have received a reasonable amount of scientific culture. One of the most interesting of De la Rive's discoveries, and which soon became eminently practical, appeared in a memoir published in 1840, in which he first brought to light the results he had obtained by applying the electric force in a direct manner to the gilding of silver and brass. De la Rive did not hesitate to make this discovery public, by communicating it at once to the Académie des Sciences, and thereby forfeiting all personal interest in its future application. It was on the occasion of this discovery that the great prize of 8000 frs. was awarded to De la Rive by the French Institute. He was selected by the Federal Council of Switzerland for an important mission to the English Government in the year 1860. During this visit the University of Oxford conferred upon him the honorary degree of D.C.L. He was a Foreign Member of the Royal Society, and in 1864 he was nominated one of the eight Foreign Associates of the French Académie des Sciences.

RESOLUTIONS OF SYMPATHY.

The telegraphers of Cleveland, Ohio, met on Sunday, 28th ult., at the Western Union Telegraph Office, and adopted the following preamble and resolutions upon the occasion of the death of Mr. George D. Phillips, an operator attached to the Western Union Company's service at that city :

Whereas, We deem it proper to tender to those he held so dear our sympathy, and to express our regrets at the loss of our esteemed friend and associate :

Resolved, That by his death the profession has lost one of its most accomplished members, the Telegraph Company a valuable servant, and his fellow-operators a kind companion and a true friend.

Resolved, That we tender to the family of deceased our heartfelt sympathies in their great bereavement.

Resolved, That a copy of these resolutions be presented to the family of deceased, published in the papers of this city and the journals of the country devoted to the interests of telegraphy.

TARIFF BUREAU. SEMI-MONTHLY CIRCULAR.

EXECUTIVE OFFICE,
WESTERN UNION TELEGRAPH COMPANY,
145 BROADWAY, NEW YORK,
January 15, 1874.

To all Offices on W. U. Lines:

Managers who have not already done so, are requested to send their post-office address, if different from the name of their office, to Wm. Holmes, Tariff Bureau W. U. Tel. Co., Box 8,398, New York.

The following changes and additions have been made since the date of the last Circular:

GENERAL INFORMATION.

Woodstock, Ala., changed to Anniston.
Government messages to and from points on other lines beyond San Diego, Cal., given in JOURNAL of December first, 1873, should be charged tariff for "this line" only. They are transmitted free beyond San Diego.

Business for Fair Haven, Conn., will hereafter be checked to New Haven.

Meriden and West Meriden, Conn., are one and the same place. Business should be checked to Meriden.

The P. O. A. of Mystic, Conn., is Mystic Bridge; of Terryville, Conn., the P. O. A. is Pequabuck; and of Vernon, Conn., the P. O. A. is Vernon Depot.

Crawfordsville, Ga., reopened.

Thomson, Ga., closed.

Gridley, Ill., closed.

The P. O. A. of 368 Mounds, Brown Co., Ill., is Mounds Station; of Grayland, Ill., the P. O. A. is Jefferson, Cook Co., and of Williams, Ill., the P. O. A. is Van Orin.

Fenton and Decatur Junc., Ill., closed.

Ashland, Iowa, changed to Eldon.

The P. O. A. of Enfield, Iowa, is Strawberry Point.

Kennedyville, Md., closed.

Business for Boston Highlands, East Boston and South Boston, Mass., will hereafter be checked to Boston.

The P. O. A. of Pepperell, Mass., is East Pepperell.

Marquette, Mich., is now a W. U. office, square 49; check direct.

The tariff to square 49, in the northern part of Michigan, will be as follows: \$1.50 from offices in squares 127 and 128; \$2.00 from offices whose rate to square 127 is 40, 50 or 75 cents, and \$2.50 from all other offices whose rate to square 127 is \$1.00 and upwards. Offices having a State rate to Michigan will use it on messages to offices in square 49. Half-rate messages will not be taken for or received from Marquette.

Orient, Mich., closed.

Osage, Mo., changed to Osage City.

The P. O. A. of Derry, N. H., is Derry Depot.

Riverton, N. J., re-opened.

Bernardsville, N. J., closed.

Tremont, N. Y., closed. Business will hereafter be delivered from Morrisania, charges for delivery 25 cents.

The following offices on Long Island, N. Y., will hereafter be in square 33: Flushing, Hicksville, Jamaica, Mineola, Glen Cove, Roslyn and Oyster Bay.

P. O. A. of Euclid, O., is Nottingham; and of Rootstown the P. O. A. is New Milford.

On and after January 15th, 1874, the "tariff for other lines" from Sackville, N. B., to offices in Prince Edward's Island, will be 60 and 4 instead of 85 and 6, as printed in Tariff Book. Offices east of Maine will disregard this notice.

The P. O. A. of Christiansburg, Va., is Bangs, Montgomery Co.

NEW OFFICES.

266 Anniston, Ala.
324 Escatawba, Ala.
441 Fulton, Ark.
441 Hope, "
37 Hawleyville, Conn.
* Newhallville, Conn., 25 2 29 New Haven.
37 Roxbury, "
37 Washington, "
* West Haven, " 25 2 29 New Haven.
309 Casey, Ill.
348 Collinsville, Ill.
348 Confidence, Ill.
309 Greenup, Ill.
348 Greenville, Ill.
348 Highland, Ill.
309 Jewett, Ill.
299 Marshall, Ill.
309 Martinsville, Ill.
328 Mulberry Grove, Ill.
348 Pocahontas, Ill.
328 St. Elmo, Ill.
348 St. Jacobs, Ill.

348 Troy, Ill.
318 Newman, Ill.
299 Judson, Ind.
397 Eldon, Iowa.
339 Clinton, Ky.
223 Johnson, Ky.
378 Clarksville, Mo.
409 Harris, Mo.
* Keyport, N. J., 25 2 41 New Brunswick.
* Matawan, " 25 2 41 "
* Washington, Middlesex Co., N. J., 25 2 41 "

The tariff to square 34, from offices whose rate to square 127 is \$1.50, will be \$2.50 instead of \$2.25, as given in JOURNAL of December 15th, 1873.

ATLANTIC CABLE BUSINESS.

We are notified that the route to China and Japan via Siberia is now open.

WILLIAM ORTON, President.

TRANSFER SERVICE.

EXECUTIVE OFFICE,
NEW YORK, Jan. 15, 1874.

On the 1st of January 1874, the following named money order offices were transferred from W. B. Hibbard's district to R. C. Clowry's district:

Central City, Col.
Denver, "
Georgetown, "
Puebla, "
Santa Fé, N. M.

On and after February 1st, 1874, Tyler, Texas, will be added to the list of money order offices in D. P. Shepherd's district, and Palestine, Texas, in same district, will be closed as a money order office.

On and after February 1st, 1874, New Haven, Ct., will be added to the list of offices specially authorized.

G. H. MUMFORD,
Vice-Pres't.

In Germany there exist insurance companies providing specially against loss by stroke of lightning, and, in the interest of these, special care has been taken to preserve the statistics of lightning strokes, the resulting loss, and the effect of lightning rods. From a recent report, we take the following statistics:

In the thirty-one years from 1841 to 1871, in Saxony, 2,239 cases of damage by lightning were recorded, of which 1,293, or 58 per cent., were cases of "hot strokes"—i. e., they set fire to the material—and 946, or 42 per cent., were the so-called "cold strokes." The total damage is estimated at fifteen millions of thalers. In consequence, apparently, of the increasing number of hard roofs—metallic roofs, slate roofs, etc.—the ratio of hot to cold strokes has apparently diminished, and for the seven years, for example, from 1864 to 1871, the ratio is 46½ per cent. of hot strokes to 53½ of cold. Of the strokes falling on dwellings with hard roofs, only 22 per cent. set fire thereto, while of those falling on houses with soft roofs—wooden roofs, thatched roofs, etc.—73 per cent. were ignited. The lightning appears, in the instant of striking, to lose remarkably its power of firing the object struck, often leaving a building entirely unharmed when it does not, at first, meet some combustible substance. The denser the body, and the better it conducts heat, the less is the power of the lightning to fire it, and a stroke falling first on such a body never sets fire to anything that it may afterward encounter in its path. Thus has it frequently happened that a very inflammable roof has been protected by an iron knob, when, as is frequently the case, this, the highest portion of the building, is first struck.

TELEGRAPHERS' MUTUAL BENEFIT ASSOCIATION.

ACKNOWLEDGEMENT OF RECEIPTS FOR ASSESSMENTS NOS. 53 AND 54, UP TO JANUARY 8TH.

6, 22, 33, 55, 58, 61, 70, 80, 84, 97, 101, 111, 120, 122, 124, 126, 129, 146, 148, 154, 156, 158, 160, 164, 175, 176, 177, 181, 189, 190, 191, 193, 197, 198, 200, 201, 203, 206, 227, 230, 240, 244, 247, 248, 252, 261, 267, 271, 289, 316, 323, 330, 341, 350, 357, 362, 364, 366, 371, 376, 382, 385, 392, 393, 406, 426, 441, 463, 476, 484, 511, 512, 516, 548, 552, 556, 557, 561, 565, 575, 577, 584, 586, 590, 592, 597, 617, 622, 630, 648, 655, 662, 663, 664, 665, 669, 670, 690, 694, 701, 710, 712, 717, 723, 724, 728, 729, 734, 735, 780, 781, 783, 785, 786, 790, 802, 808, 809, 812, 820, 823, 830, 836, 838, 841, 842, 848, 851, 897, 901, 904, 905, 906, 926, 927, 930, 939, 944, 919, 954, 956, 957, 959, 960, 963, 964, 978, 979, 980, 991, 992, 995, 998, 1000, 1002, 1005, 1011, 1014, 1016, 1026, 1030, 1031, 1033, 1034, 1041, 1047, 1050, 1055, 1057, 1058, 1063, 1072, 1098, 1099, 1100, 1101, 1105, 1106, 1107, 1108, 1109, 1110, 1112, 1113, 1115, 1117, 1119, 1120, 1121, 1122, 1123, 1125, 1127, 1131, 1141, 1190, 1193, 1194, 1196, 1198, 1208, 1211, 1217, 1221, 1222, 1226, 1227, 1234, 1235, 1240, 1241, 1254, 1255, 1268, 1269, 1281, 1283, 1284, 1285, 1286, 1287, 1288, 1295, 1307, 1308, 1309, 1311, 1312, 1313, 1314, 1315, 1317, 1318, 1319, 1320, 1321, 1322, 1329, 1340, 1343, 1344, 1346, 1348, 1349, 1350, 1351, 1352, 1358, 1366, 1371, 1372, 1385, 1387, 1390, 1391, 1405, 1406, 1409, 1415, 1418, 1427, 1431, 1432, 1433, 1437, 1438, 1457, 1458, 1465, 1469, 1470, 1471, 1474, 1475, 1476, 1481, 1483, 1485, 1498, 1500, 1501, 1503, 1505, 1513, 1514, 1515, 1519, 1528, 1529, 1530, 1531, 1532, 1542, 1546, 1560, 1563, 1572, 1573, 1580, 1586, 1597, 1616, 1623, 1625, 1630, 1631, 1632, 1635, 1648, 1649, 1650, 1652, 1656, 1666, 1667, 1672, 1673, 1681, 1682, 1684, 1687, 1688, 1696, 1700, 1701, 1702, 1704, 1707, 1709, 1710, 1713, 1714, 1723, 1724, 1728, 1733, 1737, 1746, 1747, 1750, 1751, 1753, 1754, 1755, 1756, 1757, 1758, 1759, 1760, 1763, 1766, 1767, 1768, 1769, 1771, 1772, 1773, 1775, 1777, 1785, 1788, 1789, 1794, 1795, 1796, 1797, 1804, 1817, 1820, 1823, 1824, 1828, 1830, 1839, 1840, 1841, 1857, 1858, 1859, 1860, 1862, 1863, 1869, 1895, 1896, 1911, 1913, 1914, 1917, 1942, 1963, 1964, 1962, 1963, 1968, 1969, 1972, 1991, 1992, 1993, 2004, 2005, 2006, 2007, 2008, 2009, 2010, 2012, 2016, 2017, 2038, 2040, 2041, 2050, 2053, 2057, 2060, 2061, 2072, 2074, 2075, 2078, 2079, 2080, 2084, 2085, 2089, 2092, 2093, 2096, 2102, 2106, 2110, 2112, 2123, 2125, 2127, 2124, 2137, 2139, 2152, 2174.

49, 50, 51 AND 52.

182, 332, 428, 429, 499, 500, 503, 561, 671, 684, 930, 1093, 1104, 1105, 1127, 1182, 1196, 1254, 1269, 1431, 1457, 1470, 1495, 1552, 1650, 1777, 1820, 1917, 2038, 2055.

MISCELLANEOUS.

No. 49—1028, 1144, 1208, 1676, 1813.
" 50—1028, 1144, 1208, 1676, 1813.
" 51—289, 1208.
" 52—289, 1208, 1531.
" 54—379.

INFORMATION WANTED.

The address of Frank and Manly Williams, telegraph operators, is desired by Wm. Gray, Bartlett, Cook Co., Ill.

Information is desired, and, if possible, present address of William J. Cowan, formerly telegraph operator at Crook Haven, Ireland. Please address Phil. P. Hauff, Atlantic & Pacific Telegraph Co., 198 Broadway, New York.

THE directors of the Southern & Atlantic Telegraph Company have chosen the following officers for the ensuing year: President, James R. Crenshaw; Vice-President, Charles W. Blossom; Secretary and Treasurer, W. R. Gardner; General Superintendent, George H. Grace.

MR. J. A. PATTERSON has resigned the position of Train Master and Superintendent of Telegraph of the Cairo and Vincennes Railroad Co., and Mr. T. E. Clarke has been appointed to fill the vacancy.

THE United States, with less than one-fifth the population of Europe, has more than one-half the number of publications, a fact touching comparative intelligence highly favorable to our people.

MARRIED.

FINKS—BROWN.—At the residence of the bride's father, Waco, Tex., Dec. 18, 1873, by the Rev. Dr. King, J. H. Finks to Miss Fannie Brown.

FOLLETT—TAYLOR.—At the residence of the bride's parents, at Wamego, Kan., Dec. 31, 1873, by Rev. E. R. Brown, Albert Follett, Manager W. U. Tel. Office, to Miss Mary E. Taylor.

CORRESPONDENCE.

AN ACKNOWLEDGMENT.

W. U. TELEGRAPH OFFICE,
BURLINGTON, Vt., January 5, 1874. }

To the Editor of the Journal of the Telegraph:

Henry S. Upson, for the last four years Chief Operator in this office, died in this city December 22d, 1873, of consumption, aged 31 years. He leaves a wife and one child. Not having much of this world's goods, his long illness and attendant expenses depleted his finances to a rather low point. On the morning of his death I sent a message to the operators from New York to Montreal, and through New England, stating the facts. They have responded nobly, in sympathy and more substantial tokens. May God bless them for it. At this time (Jan. 5) I have received and paid to the widow of our brother operator \$351, which is a generous gift from the telegraphic fraternity to a worthy woman. She wishes me to return to them, through the JOURNAL, her heartfelt thanks for their kind sympathy and generous remembrance.

H. N. DRURY, Manager.

To the Editor of the Journal of the Telegraph:

In fitting up large offices they are generally supplied with instruments of a uniform pattern.

The Sounders, consequently, have nearly the same pitch and quality of sound.

This, it seems to me, is a more serious error than at first appears, for any one of experience can judge whether it is not much more difficult to distinguish a call among many instruments sounding at once, when all have nearly the same sound, than when there is a variety of sounds and difference of tone in the instruments.

Indeed, this is a frequent cause of delays in messages; I have known instances where an office (fitted up in this way) had been called by small way offices almost an entire day at intervals without success.

Although this uniformity in instruments is suggested by ideas of harmony and taste, as well as economy in their manufacture, yet is it not at the expense of promptness in the transaction of business?

The case is still worse where several lines are operated on the same table, as in all large offices.

J. L. J.

To the Editor of the Journal of the Telegraph:

If a piece of wire be fastened to the two top screws of a common single cut-out, will any of the current go through the instrument, or will it all go through the instrument, or will it all go across on the piece of wire?

W. H.

Answer.—The current will be divided. The quantity upon either route will be inversely proportional to the resistance of each.

To the Editor of the Journal of the Telegraph:

If I receive a half-rate message early in the evening and wish to deliver it the same night, can I do so without charging full rate?

FRED. ECNUB.

Answer.—You should not deliver the message until the morning following without full rates being charged.

To the Editor of the Journal of the Telegraph:

Which is the correct way for this message to be written: "I will go," or "I will come," in the answer to the enquiry "Will you come?"

ENQUIRER.

Answer.—"I will go." See Webster's Dictionary on the meaning of the words come and go.

Will our correspondent, Augusta, Arkansas, please send his address to the Editor of the JOURNAL. It has been lost.

WEST OSSIPEE, N. H., Dec. 27, 1873.

To the Editor of the Journal of the Telegraph:

Supposing a collect message is presented for transmission by a responsible party, who guarantees it the check is changed in transmission and reaches receiving office as paid, and the fact is developed through an error sheet, but meanwhile the sender has left town, and present residence is unknown, making it impossible for sending office to collect amount of tolls. Is the sending office required to lose amount of charges?

G. E. M.

Answer.—In such a case it would be proper to endeavor to collect from the party to whom the message was addressed. Should he refuse, the error should be traced, and the operator at fault be held responsible for the amount. All failing, the account should be returned as uncollectible.

To the Editor of the Journal of the Telegraph:

A few days ago I received a message by train from an adjoining town to be sent by telegraph from this office. It contained two words which none of us could possibly make out. I returned message to party by next train, asking them to make the two words legible, so there would be no mistake on our part. Message was never returned to me. Was I right in sending it back for a more legible copy?

YOUNG AMERICA.

Answer.—You were right.

D.—There are thirteen words in "What time, Sunday, will boat leave for Tallahatchie River? Answer at Selma, Ala."

R. A. Palmer.—Can supply back numbers of the JOURNAL for 1873. Price five cents each, and postage added.

NEW OFFICE AT WORCESTER, MASS.

The office of the Western Union Telegraph Company has been removed from Insurance block to their new and commodious quarters on the first floor in the Spy building. This is a change which the patrons of the company will appreciate, and which will afford the company increased and ample facilities for the transaction of its large business.

The room in the rear of the counter is divided by a partition seven feet high, of ash and ground glass, handsomely trimmed with black walnut. The operating tables are made of ash and black walnut, the divisions into sections being made by the use of heavy plate glass. The wires, twenty-five in number, enter the building over the front door and windows, and are run on black walnut bridges to the switch board on the south wall near the centre of the room, where they are divided for the different tables. The battery room for the wires to Providence, Norwich, Nashua, and one of the Boston wires, is in the rear of the Spy counting-room, and contains sixty cups, battery power on all the through lines being furnished at the main offices in Boston and New York.

BURNING OF A WESTERN UNION OFFICE.—At a fire which burnt nearly the entire town of Helena, Montana, on the 9th inst., the office of the Western Union Telegraph Company was destroyed.

DAMAGE TO WIRES BY STORM.—From Toronto, Canada, we learn that the sleet storm which prevailed in that vicinity on the 7th and 8th inst. was the most destructive to telegraph wires of any ever experienced. Communication east and south-west was almost entirely suspended. The same storm was unusually severe west of Pittsburgh, Pa., all direct communication directly west being suspended.

THE telegraph wires in the vicinity of Cimarron, New Mexico, were badly damaged by a hurricane which prevailed there on January 2d and 3d.

THE SOCIETY OF TELEGRAPH ENGINEERS.

The annual general meeting of the London Society of Telegraph Engineers took place on the 10th of December last. The annual report was read by the Chairman, Mr. W. H. Preece, and showed that the affairs of the society were in a very prosperous condition. The total number of members, including honorary, associate and foreign members, at the date of the report, was 512. The society has lost several of its most prominent members by death during the past year, among whom may be mentioned Sir Francis Ronalds, the very father of telegraphy; Mr. Lendl of Berne, and Mr. George Saward of Atlantic cable celebrity. The balance of funds on hand at the close of the fiscal year was over £500. A number of changes and modifications have been made in the rules and regulations of the society. Any foreign member can now become a life member upon the payment of ten pounds. The following officers were elected for the ensuing year: President, Sir William Thompson; Vice-Presidents—Lord Lindsay, Latimer Clark, R. S. Cully and Professor G. C. Foster. Auditors—J. Wagstaff Blundell, Fred. C. Danvers. Treasurer, Major Webber, 101 Cannon street, E. C.; Hon. Secretary, Major Frank Bolton; Secretary, George E. Preece.

VIENNA ACADEMY OF SCIENCES.

Dr. Steintz has communicated some interesting facts with regard to the changes in length and elasticity experienced by a metallic wire when traversed by a galvanic current. It has been disputed whether these changes are the same as those produced by heating without the galvanic current, or not. The author determined the temperature of the conducting wire from the fusion of a thin coating of stearine; while he raised to the same degree of temperature a non-galvanized wire surrounded by a system of tubes containing stearine in process of solidification. The co-efficient of elasticity was determined by oscillations of tension; and change in length by an apparatus with two mirrors, indicating with precision thousandths of a millimetre. The result arrived at is, that the change in elasticity is the same in the wire simply heated as in the conducting wire; while the change in length presents marked differences. A wire about 53.5 m.m. long and 0.5 m.m. thick underwent, in a change of temperature of 37°, a change of length 0.040 to 0.63 m.m., or about 15 to 20 per cent. of that effected by simple heating. The expansion was the same in wires of brass, copper, platinum, and soft steel. Hard steel showed hardly any galvanic change. The elongating action does not take place suddenly on closure of the current, but progresses by degrees; and Dr. Steintz considers that the thermal vibrations arising from the galvanic current are polarized, and thus produces a more notable expansion than the ordinary thermal vibrations.

PANICONOGRAPHY is the name given to acid engravings on zinc, patented last July. It is a cheap substitute for wood engraving, and reasonably fine impressions are already shown by what is called the Ringwalt Process. The advantages claimed for it are that zinc furnishes a good printing surface and prevents the warping and shrinkage incident to wood blocks. A surface of zinc, it has been discovered, can very readily be made obedient to the chemical manipulations of any artist, and that in this way he can engrave any desired object. M. Gillot of France is the discoverer of Paniconography.

STUDY is to the mind as exercise is to the body—both alike act as developing powers, but neither body nor mind can be carried to a relative excess of cultivation except at the expense of the other.

Journal of the Telegraph.

This Journal is issued on the 1st and 15th of each month. Its circulation is over 8,000. It goes to every State, Territory and Province on the Continent. It has become a necessity, and is always welcomed as a friend. No better medium for advertising exists.

TERMS:

TWO DOLLARS PER ANNUM IN ADVANCE

Address—

JOURNAL OF THE TELEGRAPH,
Western Union Telegraph Company,
145 Broadway, New York.

NEW YORK, JANUARY 15, 1874.

PRESIDENT ORTON AND THE POSTMASTER-GENERAL.

In the JOURNAL of January 1st, we commenced the letter of President Orton to the Postmaster-General upon that portion of the report of the latter relating to the policy and management of the Western Union Telegraph Company, and to the aspersions which he deemed proper to cast upon the personal motives of its President. The concluding portion of the letter will be found upon another page of the present issue.

Rarely in the history of any country has there appeared so extraordinary an official document as that of the Postmaster-General, and, probably, there cannot be found record of an instance where signal discomfiture followed so rapidly, and was so complete, as in this case. Beside its argumentative character, Mr. Orton's letter is extremely valuable in the facts collated touching the action of the Government toward the telegraph from the establishment of the latter to the present time.

From this discussion it has been rendered painfully evident, and it is disgraceful to the country that it should be so, that to those in the private walks of life, politeness and courtesy seem mainly to be confined, and that they possess almost a monopoly in that desirable organ of quality commonly known as brain.

NEW LINE TO LAKE SUPERIOR.

The new line of the Western Union Telegraph Company between Detroit and Marquette, Mich., 649 miles in length, has been completed and opened for business. It runs along the west shore of Lake Huron, and the southern shore of Lake Superior, through Bay City, Alpena, Mackinaw and Sault Ste. Marie; 189 miles is along a railway, the greater portion of the remainder going through dense forests. The line is worked without repeaters, with 33 cups Callaud battery at Marquette, 100 at Sault Ste. Marie, and 85 of Grove at Detroit.

As an evidence of the benefit of telegraphic communication to this section, it may be stated that, between Detroit and Marquette, to receive an answer to a letter sent by mail would require six weeks.

THE GOLD AND STOCK TELEGRAPH COMPANY.

The Gold and Stock Telegraph Company have recently issued a circular to its subscribers, calling attention to the fact that that Company was the pioneer in the business of reporting by telegraph the fluctuations in the prices of gold and the various securities dealt in by the Exchanges; that it had brought the system to a high point of perfection by patient industry and zealous effort, and had expended a large sum of money in acquiring patented improvements of great value in the line of its business, but that a company calling itself the Manhattan Quotation Company, has appeared on the field with an instrument which in several respects infringes upon various of the patents owned by the Gold and Stock Company, for the use of which instrument the Manhattan Company have induced a number of persons to subscribe. An action at law has been brought to prevent the use of this instrument. There is a bad feature in this case. It seems that the Manhattan Company are misleading the public and its patrons as to the true condition of affairs, and in this manner are rendering the latter liable in damages to the Gold and Stock Company, in the event of the suits which have been commenced to restrain its operations being decided adversely. And there seems to be no doubt of this result.

In support of the claims made, the Manhattan Company are publishing what purports to be opinions of leading patent lawyers in favor of the originality of the instrument now being used. These lawyers, in letters embodied in the circular referred to, state explicitly that the instruments upon which their opinions were based were not the instruments against the use of which the Gold and Stock Company are taking action. This looks very much like fraud, inasmuch as the Manhattan Company, although informed through its President of these later letters of the counsel, have not thought proper to correct the misapprehension of the public on this point.

Much could be said here in favor of maintaining vested rights, but it is not necessary. The good sense of the public will at once allow, without taking into account the fact that the Gold and Stock Company originated the business and has served them well for years, that it should be protected in the enjoyment of the property which has been honestly acquired by invention or purchase, and that it should not be annoyed by piracies, attempted or real.

The facilities possessed by the Gold and Stock Company in acquiring and distributing the peculiar information desired by subscribers are very great. In neither quantity nor value can its reports be equalled, and so long as the existing arrangements between it and the Western Union Telegraph Company continue, this condition will remain.

A speedy decision upon the points in dispute is to be hoped for, and we trust that the courts will no longer allow a delay which serves only to prolong

the injustice under which the Gold and Stock Company are laboring.

The Western Union Company being largely interested in the operations of the Gold and Stock Telegraph Company, it is desired and expected that all employes of the Western Union Company will, to the utmost of their ability, facilitate the business, and in a general way promote the interest of the Gold and Stock Company.

THE BRAIN AND THE TELEGRAPH.

There is a wondrous resemblance between the nerve tissues of the human system and the wires which permeate a continent. There is also a very intimate dependence of the one upon the other. At the base of the brain, in extensive convolutions, lies the great centre of sensation. All the blood-vessels are in connection with it. By interaction, the one with the other, all our nervous power is produced. Branches of nerves, from numerous ganglionic centres along the spine, connect with main nerves running to the great centre station in the cerebrum of the brain. The nerves of smell, the nerves of sight, the nerves of hearing, the nerves of touch, all with peculiar functions, have their termini in the head. It is a splendid telegraph system which needs no repeaters but has a duplex. There is not a pebble enters the shoe, or a pin probes the back, or a bug knows the epidermis, but it is known at headquarters, and at all the offices. The simple call of a flea, at dead of night, awakes every office at once, and makes the chief executive officer jump. There's a system for you, you automatics!

Now this brain telegraph is the reigning king of all work, but of none more than the telegraph. It is a part of its machinery, and its finest specimen. It is a willing worker, but a much abused one. Often cheated of its oil and rest, it works on and does its best. But it has conditions. There is a point at which it tires. There are influences which swerve its action. There are sounds which change its direction. There are thoughts which prolong themselves, like the bullet, long after it has left the rifle. To all these susceptibilities of the brain the telegraph is harnessed. It concerns all that so susceptible an organ be kept fresh, and healthful, and undisturbed in doing telegraphic work.

We believe the worst errors occur from wearied brains, made weary by unnecessary weakening of its powers. In certain cases the action of excessive care and desire for accuracy so presses, as to cause the very error it struggles to avoid. The most expert and conscientious operators have made some of the very worst blunders. Sometimes the brain of an operator, from the very action of a lively imagination, prophesies a coming word and writes "millions" when only "thousands" come. Sometimes where the word "Mary" comes, he will substitute "Sally." It comes more sweetly to him. Many an operator has to stop when the bugle in the street plays "Nancy is my darling," or go on at the peril of putting "Nancy" in an order for whiskey. What shall we do with this brain? We must care for it. We must give

pure air, and quiet, and rest. We must let it sleep regular hours, and limit and vary its work. We must recognize its claims for healthy food to do healthy labor. In fine, all this means that good health is necessary to a successful telegraph system. It means, also, that it is everybody's business to be as healthy as he can.

BOUND VOLUMES OF THE JOURNAL.

We have a few bound copies of Volumes IV., V., and VI. of the JOURNAL OF THE TELEGRAPH, which can be had for \$2.50 per copy.

Mrs. Saulsbury, the mother of Johnson's lovely, lively Hetty Thrale, was fond of relating an episode in Lord Harry Pawlett's courtship of a lady friend of hers. The lady in question was seized with a desire to possess a couple of monkeys of a particular species. Anxious to gratify her whim, Lord Harry—a bad scribe, with loose notions of spelling—wrote off to a friend in the East Indies, entreating him to procure the pair of monkeys, and send them home immediately. Unfortunately, he chose to spell two, *t-o-o*, and to write it in characters all of one height. The receiver of the order read it 100, and, to Lord Harry's dismay, notified the shipment of fifty monkeys of the required description, to be followed by the other half-hundred as speedily as possible. A century before, Sir Edward Verney wrote to his son: "To requite your news of your fish, I will tell as good a tale, and as true. A merchant of London, that writ to a factor of his beyond sea, desired him, by the next ship, to send him 2 or 3 apes. He forgot the *r*, and then it was 2 o 3 apes. The factor sent him fourscore, and says he shall have the rest by the next ship; conceiving the merchant had sent for two hundred and three apes. If yourself or friends will buy any to breed on, you could never have such a chance as now!"

All of which proves that mistakes in sending figures are not confined to the telegraph, and that chirography may have much to do with those it makes.

THE NEW YORK ASSOCIATED PRESS originated with David Hale of the *Journal of Commerce*. He was first aided by James Gordon Bennett, and the two soon secured the co-operation of all the other leading dailies. It now delivers its dispatches, gathered from every quarter, to all sections of the Union. It has many special and subordinate agencies in this and all other countries. Equality among the membership is preserved by compelling any paper belonging to the association, which receives a special dispatch, to promptly send it to all other members, this to be paid for by whoever uses it.

THAT noble lives are lived by quite ordinary people, who say nothing about it, is once in a while proved by the noble deaths that suggest the story of the unheard-of years preceding them. Such a life must have been that of James Marr, who recently, near the Australian coast, was washed overboard by a heavy sea, which at the same time carried away the mainmast of the schooner. Marr clung to the mast until he saw, with the quick eyes of an old seaman, that it hampered the vessel; then, simply

enough, and without a word, he gave up his only chance of life for his comrades' sake. He motioned them to cut the mast adrift; they bade him good-by, and he nodded for answer as he quietly sank back in the waves.

THE OHM.

"Tyro" asks us two questions. The first is: "What is the origin and true meaning of the word 'Ohm'?" This question was answered in the first volume of the JOURNAL, six years ago. It then seemed a very ominous word. Varley, the English electrician, was here. He was full of mysterious signs and processes. Ohms and megohms, volts and farads, megafarads and megavolts, microfarads, microhms, microvolts, were the atoms of his learned lingo, and much awe he created thereby. We have become familiar to the scientific patois since then. All these terms are found needful and convenient. Every inquiry about them merits an answer.

The term "Ohm" is derived from the name of the celebrated electrician who first ascertained the laws of electrical resistance, and is a *measure of resistance* of which it is the unit, in the same way as we use the inch or yard in the measure of length. The "ohm," as the unit of resistance, was adopted by a committee of the British Association, many years ago, and is now acknowledged standard of resistance throughout the world.

Before the adoption of the term Ohm, Mr. Varley had adopted as a unit that condition of the galvanometer and rheostat expressed by the introduction of a single mile of No. 16 copper wire. The deflection he called the unit of resistance and was called "Varley's unit." The ohm is one-twenty-fifth of Varley's unit, and represents the resistance of about 210 feet of copper, No. 16, or galvanized wire No. 8, unexposed to disturbing causes and in a temperature of 60° Fahr.

The second question is one frequently asked and often answered: "Is there any way to prevent the copper from depositing on the bottom of the porous caps?" The remedy is a simple one. It consists in preventing the zinc plate from touching the porous cell. If allowed to touch, local action will be set up and copper be at once deposited.

TRUE WORTH.—A really modest and meritorious person will never make pretensions of any kind. His manner and expressions will always have a tendency to underrate his real ability, not because he will pretend to be less capable than he really is, but as so many men have become pretentious in their manners and expressions, he fears he may be considered as such. We are, in consequence, too apt to consider the extent of the capacity of those whom we meet a little below the standard indicated by their acts and expressions. Therefore, true merit is seldom properly appreciated, and its cultivation is never greatly encouraged. On the contrary, pretence is almost always successful. He who is pretentious affects the interests of society in a similar manner as the swindler. He induces men to doubt the capacity of others, and often refuse aid and employment, because they measure the merits of all by those of the pretensions fop and the conceited ignoramus. Many an honest and skillful man, and

many a valuable improvement, has been refused support and adoption because the pretentious swindler has previously misled the people and imposed upon them outrageously. Pretensions of every kind are the true indications of a weak mind or a would-be swindler.

THE LIMIT OF PERPETUAL SNOW.

The altitude above sea-level of the limit of perpetual snow has been the subject of some observations and deductions recently presented by Grad to the Paris Academy. He shows that not only the diminution of temperature in the higher strata, but also several other conditions, must conspire to fix this altitude; such as the depth of the annual fall of snow and the dryness of the atmosphere, the direction of the winds, and the amount of the cloudiness. Grad finds the altitude of the lowest limit of permanent snow to be less within the tropics than under the latitudes of twenty to thirty-five degrees, whence again it diminishes to three thousand feet in the latitudes sixty degrees south and sixty-five degrees north. For no known part of the globe does the belt of perpetual snow descend to the level of the sea, nor to within less than a thousand feet of altitude; not even in the region where the average temperature of the cold half of the year is below freezing, as in Greenland and Spitzbergen.

It is only the glaciers that descend to the sea-level in the country south of forty-five degrees south latitude, and north of sixty degrees north latitude, by reason of the excessive falls of snow accompanying most winds.—*Harper's Monthly*.

ANY one who will read the reports of the Pacific Surveying Expedition sent out to take soundings for the Japan Cable, will be amply repaid for his time. Among the submarine wonders discovered are two mountains, one of them with an elevation of 4,000 feet, or higher than Vesuvius, while, more important still, the existence of a current similar to the Gulf Stream, and extending in a long curve from shore to shore of the ocean, has been satisfactorily demonstrated.

The London *Money Market Review* has the following suggestive quotation from a financial circular: "New undertakings have, for some time past, been in abeyance; but experience has always shown that after a long period of stagnation, new enterprise forces itself into prominence, and I am specially pleased to state that Electricity, which has given such marvellous results in the traffic of intelligence, is now on the eve of still greater development in connection with commercial and manufacturing progress. Hitherto the cost of electric force has acted as a bar to its universal employment in connection with railways, brilliant lights at sea, the reduction of metals, plating, and the fine arts generally; a great advance has, however, been made in the discovery of an important method which will admit of its application as a continuous and sustained power, the extent of which it is almost impossible at the present moment to realize!" Is Payne in London?

SUBSCRIBERS to the *Panama Star and Herald* could hardly find fault with an excuse recently offered by that journal for not being out in time. The editor says that the Government troops were keeping up a continuous fire on the door of his sitting-room, and half a dozen shots did not vary three feet in striking. "To this annoyance," he says, "we must attribute our delay in getting out this edition, for it is difficult to persuade men to work under a steady and dangerous fire."

COMMUNICATION IN RAILWAY TRAINS.

The problem how to secure the best mode of stopping a railway train under palpable danger, or any of the contingencies incidental to railway traveling, is one that has long engaged the attention of the public, shareholders, and travelers. So far back as 1852 a committee of railway managers was constituted to investigate the matter, and to receive suggestions for the remedy of the want. Numerous inventions were submitted—some of them of the most absurd and impracticable description: but in the end the committee was unable to agree, thus no definite result was arrived at. Early in 1853, upon recommendation of the Board of Trade, this committee was recalled to action, and requested to resume its labors on a more extended scale. The committee addressed communications to all the British, and to some continental railway companies, applying for information and suggestions which it might be in their power to afford. The result was that another large crop of schemes was submitted. The inventions had up to this period been almost entirely mechanical, electrical science not being sufficiently advanced to attract attention to the practicability of the adaptation of electricity to the purposes in view. The committee comprised the late Captain Huish, then the manager of the London and North Western, Mr. Seymour Clarke, of the Great Northern, and other leading managers, and these gentlemen recorded the result of their labors in an elaborate report, dated March, 1853. Again, however, the committee failed to arrive at any conclusion as to the particular system which should be adopted, excepting that they recommended the establishment of a system of cord communication between the guard and the driver. Accordingly, the trains were furnished with this cord communication, but passengers were prohibited from making use of it. This rude contrivance gradually fell into disuse and was unavailable whenever it was required. Things remained in this state until 1860, when the murder of M. Poinso, a French Judge, while traveling upon a French railway, led to the appointment of a commission, composed of members of the French Government, of the Legislature and of several eminent engineers, to advise upon the best means for enabling passengers to give an alarm to the driver and guards. This circumstance, after the lapse of seven years, caused some little attention to be again paid to the subject in England; but it was not until 1864, upon the assassination of Mr. Briggs, while traveling upon the North London Railway, that any fresh organized effort was made to place some means of communication in the hands of passengers. In that year (1864) another committee of managers was formed to consider proposals "for affording means for enabling communications to be carried on between different portions of a train whilst in motion." No fewer than 196 models and plans were sent in to the committee, who reported, in March 1865, that, notwithstanding the plethora of schemes, they were, like their predecessors of 1852 and 1853, unable to agree in their recommendation of any one particular system. It may be useful and interesting here to reproduce the remarks which this committee of 1865 appended to their report as regards the mechanical, optical, and sound signals submitted to them:—

1. As regards mechanical signals, the committee reported—"That the varying shapes and sizes of the vehicles of which trains usually composed, and the frequent changes to which trains are exposed by rearrangement and division at junctions, &c., are the chief reasons why all attempts made to supply ef-

fective signals by mechanical contrivances have failed."

2. As regards optical signals—"That whether the medium employed be a reflecting surface, a lamp, or a flag, all such signals—depending as they would upon the exercise of constant vigilance—must, even under the most favorable circumstances, be uncertain in their operation, and would be wholly useless in tunnels and in foggy weather."

And with respect to sound—"That signals depending upon sound are as uncertain, if made at a distance from the engine-driver, as those depending upon sight; repeated experiments having demonstrated the fact that no noise, however loud, shrill or continued, can be heard, even when the train is short, when there is a head-wind or when the speed of the train is considerable."

In this same year 1865, a bill was introduced by Mr. H. B. Sheriden, the member for Dudley, with the object of making the establishment of some system of communication between passengers and guard compulsory upon the companies. It was not, however, until 1867 that it passed the Commons. Upon its second reading in the House of Lords it was referred to a select committee, of which the Duke of Richmond was chairman. The committee having taken the evidence of the principal railway managers, and of Mr. S. M. Martin, Mr. W. H. Preece, and Mr. C. V. Walker (those gentlemen who have successfully experimented with electricity as a means of communication), reported in favor of the bill; but it was withdrawn at the last moment, on the understanding that the matter would be taken up by the Government itself in a contemplated measure for the general regulation of railways. Meanwhile, Colonel Yolland, R. E., was deputed by the Board of Trade to investigate and report upon the whole subject, and especially upon the electrical systems. That gentleman made his report on the 21st February, 1868, which was presented to both Houses of Parliament, and looked upon as the herald to the introduction of the proposed legislation by the Government. Very shortly, however, after the presentation of this report, the Conservatives relinquished office, but not before they had carried their contemplated "Railway Regulation Act," which included in its provisions the following clauses:—"After the 1st April, 1869, every company shall provide and maintain in good working order, in every train worked by it which carries passengers, and travels more than twenty miles without stopping, such efficient means of communication between passengers and the servants of the company in charge of the train as the Board of Trade may approve. If any company makes default in complying with this section, it shall be liable to a penalty not exceeding £10 for each case of default. Any passenger who makes use of the said means of communication without reasonable and sufficient cause shall be liable for each offence to a penalty not exceeding £5."—*London Railway News*.

ELECTRO-DEPOSITION OF ALUMINUM.—John A. Jeancon, Newport, Kentucky, is the author of the following process: Dissolve the desired salt of aluminum or a double salt of aluminum and potassium, sodium, etc., in distilled water, and concentrate to 20° Baume, (at 50° Fahrenheit). The battery used is either four pairs of Smee's zinc-platinum or three Bunsen's zinc-carbon, the elements connected for intensity. The solution is heated to 140° Fahrenheit, slightly acidulated, and a plate of aluminum is attached to the negative wire in working.

AN UNVEILED MYSTERY OF MARINE DISASTERS.

A most startling inquiry has recently been raised in England regarding a new theory of the cause of deviation in the mariner's compass. Not long since a writer in the *Nautical Magazine*, a very high authority on marine matters, advanced some remarkable facts, going to show that in iron steamships one hitherto unsuspected source of magnetic deviation arises from the effects of unequal and varying distribution of heat over the metallic hull. He illustrated his meaning by citing the case of an iron steamship going up the Red Sea, which had the rays of a blazing sun impinging on one side of her hull in the morning and on the other side in the evening, the effect being a very marked difference in the morning and evening deviation. Again is cited the case of an iron steamship making a passage from Liverpool to New York, and, when in the alternate bands of tepid Gulf Stream and frigid Polar water, between Georges and Nantucket, with about thirty fathoms of shoal water, the master found a compass alteration of ten degrees. A similar deviation has been observed on board vessels lying in port when the sun has been shining powerfully on one side of the ship and the other has been shaded. An experiment in thermal electricity shows that if different parts of a metallic bar be unequally heated, or if one part be cooled by application of ice and the other heated by a spiral lamp, the electric current is set up; and the quantity of electricity excited is proportionate, not to the absolute heat communicated, but to the difference of temperature in different parts of the body. But, as yet, no experiments have been conducted to test the correctness of this novel view, and to determine how far, if at all, under the conditions named, the magnetic guide of the seaman may lead him ruinously astray.

Not strange to say, the writer of the article, who modestly suggested merely putting his views and deductions to a crucial test, has been sharply overhauled for his presumption in proposing such magnetic inquiry. The venerable head of the Admiralty Compass Department severely criticises him on the ground that his own observations have brought no such result to light, and dismisses the theory as not holding water. But, despite the weight of such high authority, the facts stated and their consonance with a known law of thermo-electricity, as well as the difficulty of explaining many compass deviations in iron ships upon any principle heretofore propounded by scientists, warrant and demand some satisfactory, if not exhaustive, experiments to decide the question at issue.—*N. Y. Herald*.

ZURICH SOCIETY OF NATURAL SCIENCE.

In the *Vierteljahrsschrift* of this society, Dr. Rudolf Wolf has recently published the thirty-third number of his *Astronomische Mittheilungen*, in which he deals with the relation of sun spots to the variation of the magnetic needle. The author gives a series of daily observations of sun spots, during 1872, made at Zurich, Peckeloh, Münster, Palermo, and Athens. The mean relative number obtained is 101.7 and for the years 1866-72 inclusive, the series runs thus: 16.3, 7.3 (min. 1867), 37.3, 73.9, 139.1 (max. 1870), 111.2, 101.7. Dr. Wolf has constructed a formula by which the average yearly variations of magnetic declination, in a particular place, may be calculated from the relative sun spot number (two constants for the place being given). In this way, for example, he obtains for Munich the quantity 10° 80' as representing the magnet variation for 1872; the number got from observation is 10° 75', showing a close agreement.

NEW EXPERIMENTS WITH THE ELECTRIC CURRENT.

MM. P. and A. Thénard communicate to *Les Mondes* the following conclusions derived from recent electrical researches:

1. The vapor of water does not hinder the production of the current, which decomposes it into its constituent gases. 2. The current, while determining the combination of nitrogen and hydrogen, decomposes equally ammoniacal gas; but, in both cases and without absorbent bodies, there is found in the gaseous mixtures a quantity of ammonia quite feeble but sensibly equal. 3. Nitrogen, under the influence of the spark and the vapor of water, disappears to produce an undetermined body which is believed to be nitrite of ammonia. 4. Gaseous phosphoret of hydrogen is similarly incompletely decomposed by the current, and this decomposition is accompanied with phenomena which prove first the formation of liquid phosphorus, then solid phosphorus, and lastly a body supposed to be the same substance in its amorphous state. 5. The current acting on a mixture of gaseous phosphoret of hydrogen and bicarburet of hydrogen reproduces one at least of the phosphoric alkalies. 6. Under its influence, the bicarburet of hydrogen alone condenses rapidly into an odorous liquid, soluble in ether but insoluble in water. 7. On the other hand, the monohydrate of methylene is transformed in presence of water into marsh gas, into pure hydrogen, into a powerful acid soluble in water, and into a resinous body differing from the viscous substance furnished by the bicarburet.

MUTUAL ACTION OF VOLTAIC CURRENTS—M. BERTRAND.—In 1871, M. Helmholtz proposed a new formula to replace Ampère's law on the elementary action of circuits. M. Bertrand considered the new law did not correspond to any force of determinate strength and direction operating between two elements, and that it must be rejected. M. Helmholtz recognized that no force, according to his law, would represent the action of an infinitely small element on an infinitely small element; but he does not see here a decisive argument against his theory. The action of two elements is composed of a force and a couple acting on each of them, and this, in his opinion, does not involve contradiction. But (urges M. Bertrand), following out such principles to their conclusion, and calculating the moment of the couple, one finds that the force producing it must have a finite intensity. Whatever the tenacity of a wire, an infinity of forces of finite strength distributed throughout its length must produce rupture. M. Bertrand here produces a memoir, in which M. Helmholtz has lately, in the Berlin Academy, returned to the question; and proposes shortly to reply to it.

NOTE ON THE BEST DIMENSIONS TO GIVE TO ELECTRO-MAGNETS—M. DU MONCEL.—The writer constructs a formula from which flow some important conclusions; more especially (1) That for resistance of equal circuits, the diameters of an electro-magnet should be proportional to the electromotive forces; (2) for equal electromotive forces, the diameters should be in inverse proportion to the square root of the resistance of the exterior circuit, including the resistance of the battery.

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"SWITZERLAND,"	Building.	"SWITZERLAND,"	Building.

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First Cabin.....	\$100. gold.
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Steerage.....	35, currency.

Prepaid Certificates, \$36 currency.

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	<i>From</i> <i>Philad'a.</i>		<i>From</i> <i>Liverp'l.</i>
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Cabin.....	\$100 currency.
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Freight will be received at all principal points in the West and South, in connection with the Pennsylvania Railroad, Southern Mail Steamship Company and Clyde's lines, and through Bills of Lading issued for Antwerp, Bremen, Hamburg, Havre, Amsterdam, Rotterdam, Liverpool, London, Glasgow, Belfast, Hull and Leith.

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William Hunter & Co., Agents, Liverpool. B. Vonder Becke, General European Agent, Antwerp.

WATTS & COMPANY,

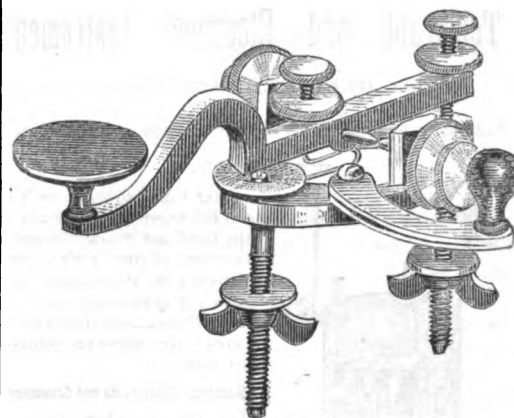
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SOLE MANUFACTURERS OF THE

PATENT CIRCUIT-CLOSER KEY,

Which has met with marked success.



Price, \$5 50 plain; \$7 nickel-plated.

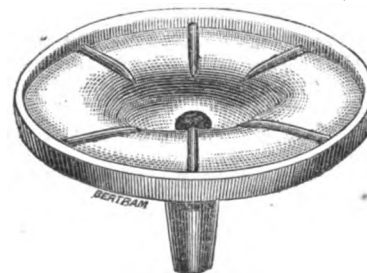
The following is from a competent judge, written after some weeks' trial.

145 BROADWAY, NEW YORK, {
Sept. 22d, 1873.

DEAR SIR,—Your circuit-closing attachment on the key, left with me for trial, is pronounced by all who have used it a decided and much-needed improvement on the common form.

Respectfully,

A. S. BROWN, Manager.



The Best Form of Battery Insulator Offered.

SIMPLE AND PERFECT.

Made of porcelain, handsome in appearance. Occupies little more space than the cell it supports. Each cell of battery completely isolated. Leakage is reduced to the minimum by the use of it.

General Superintendent Van Horn, Southern Division W. U. Tel. Co., writes of it:

"We have now in use a thousand or fifteen hundred of your battery insulators, and expect to order many more before the close of the year.

We have never used any battery insulator that equals it in any respect. In fact, it appears to be as near perfect as we can reasonably expect, in a contrivance for that purpose."

Price 40 cents.

We offer a very excellent article of Galvanized Wire, superior to any in the market. The linemen on Baltimore and Ohio R. R. say they have never seen its equal for toughness and flexibility.

Special attention given to building. Estimates given for any amount of material for telegraph construction or extension.

SWITCHES, GALVANOMETERS, RESISTANCE COILS, &c., to order.

Designs for Switch Boards for special service furnished.

SCOTT'S PATENT ANNUNCIATOR, for Hotels and Residences.

Security Message Hook.

PATENT APPLIED FOR.

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Price per dozen \$3.00.

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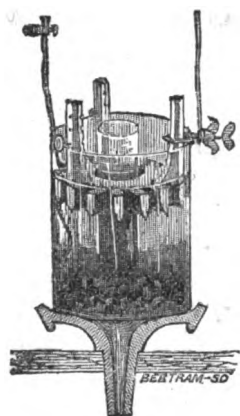
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Patented Dec. 31, 1872.

Over SIX THOUSAND cells of the Baltimore Battery in use by the Gold and Stock Telegraph Company of New York in their Private Line Department, is a sufficient acknowledgement of its merit, as a form of the gravity battery, combining the valuable principles of

Economy, Cleanliness and Constancy,
 "—in fact a base-burner."

F. L. POPE,
Telegrapher, July 5th, '78.

SELF-FEEDING,

No Sulphate of Copper can reach the Sulphate of Zinc Solution.

The shape of Zinc and Copper, which, with the tube, were patented December 31st, 1872, secures the largest surface with least weight of the metals. Half pound sulphate copper per month, ample supply for No. 2, or 3.

Following is one of the many letters we have from reliable telegraphers:

PIEDMONT, W. Va., September 28th, 1878.
 Messrs. WATTS & Co.,
 Baltimore, Md.

GENTLEMEN:—On January 1st, 1873, I put up 75 cells of your No. 2, Baltimore Battery, in place of 40 cells of carbon, from which two railroad wires of 100 miles each are supplied. It has not since been taken down or cleaned, and has required no attention, except to fill the tubes with blue stone, once each month, and replenish the fluid once or twice during this period, made necessary by evaporation.

I am fully convinced, from long experience, that this is superior to any other form of the gravity battery.

It has now been in constant use for nine months, and will not need new zinc until after January next.

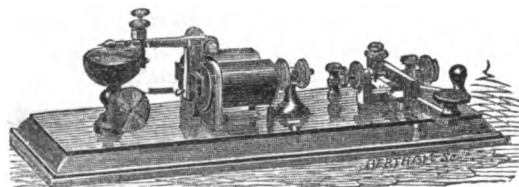
Respectfully,
 J. G. NESBITT, *Manager*.

ORDERS FOR THIS BATTERY PROMPTLY FILLED.

A large stock constantly on hand.

No. 1 for Electro-motors, R. R. signals or similar service, \$3.25
 No. 2 ordinary local or Printing Telegraph main \$1.75
 No. 3 ordinary main \$1.25

A very Superior Main Line Sounder.



Brass, \$22.50. Nickel-plated, \$25.00.

For wrecking purposes or temporary offices, this instrument is without a rival.

A perfect combination, handsome, good-sounding instrument.

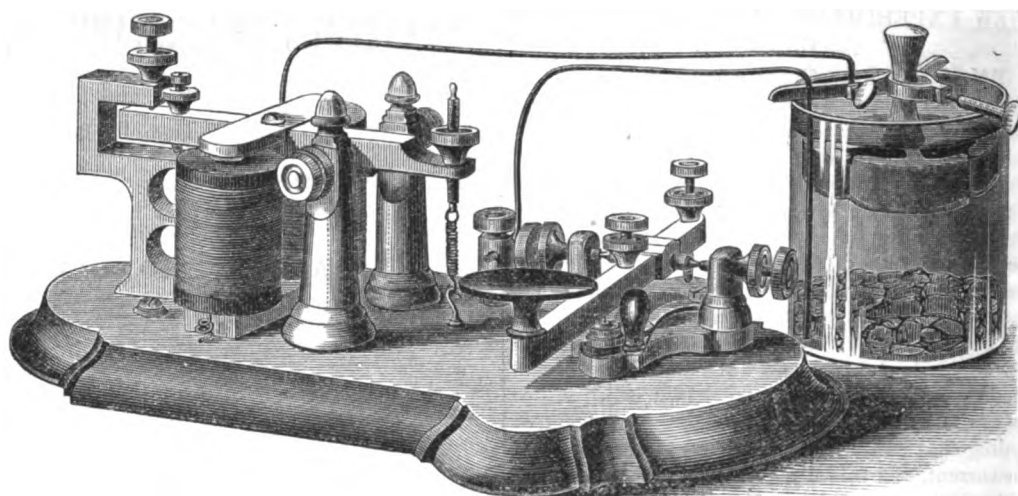
NO LOCAL REQUIRED.

Well seasoned black walnut box, large enough for pencils, paper, pliers and office wire, in addition to the instrument, \$4. Larger size for climbers, vises, &c., \$5.

RELAYS, SOUNDERS AND KEYS,

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[Our Challenge Sounder is the noisiest instrument made.



PARTRICK, BUNNELL & CO.'S Champion Learners' Instruments.

COMBINED No. 1 SOUNDER AND KEY, with

BATTERY, OFFICE WIRE, CHEMICALS, and a thorough

BOOK of PRACTICAL INSTRUCTION in the Art of Telegraphy

Which latter gives all necessary directions for setting up the Battery and complete apparatus, and operating them for practicing or communicating purposes.

THIS IS WARRANTED TO BE, BEYOND ALL COMPARISON, THE BEST APPARATUS EVER OFFERED FOR THE USE OF STUDENTS OF TELEGRAPHY.

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The BOOK OF INSTRUCTION is a clear and practical explanation, by an experienced telegrapher, of every fact and principle of modern telegraphy and its apparatus which a student of the art could possibly require to obtain, in undertaking to become an accomplished sound operator.

PRICE OF APPARATUS complete, with Book of Instructions, Battery, Wire, and all necessary materials for one complete office outfit, ready for shipment, \$10, sent by Express, C. O. D.; or \$9.50, if money order for that amount be sent in advance. The latter plan will additionally save the purchaser the Express charges for returning money.

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NEW YORK, FEBRUARY 16, 1874.

WHOLE NO. 151.

PNEUMATIC DESPATCH TUBES.—THE CIRCUIT SYSTEM.

BY CARL SIEMENS.

In December, 1869, when the telegraph lines were being taken over by the Government, Messrs. Siemens Brothers received an order to lay an experimental circuit between the Central Telegraph Station and the General Post-Office, St. Martin's-le-Grand. This line was completed and opened for traffic in February, 1870, and after half a year's work, the great advantages of the system having shown themselves, a further length to Fleet street, and subsequently to the West Strand office, Charing Cross, was decided upon.

Fig. 1 is a diagram of the pneumatic tubes laid in London on the Siemens system.

I, II, III, represent the stations at Telegraph street, the General Post-Office, and Temple Bar, and IV the station as it was proposed for Charing Cross, but the latter has been fitted with two instruments similar to the two at Telegraph street. These two instruments were necessary, as, owing to the shape of the premises at the West End office, it was found difficult to join the ends of the up and down lines with curved pipes of sufficiently large radius to allow carriers to pass from one line to the other. The ends of the up and down lines of tubing have, therefore, been joined by means of a bend of 6 inches radius, and an instrument has been placed on each tube.

A steam engine, placed in the basement of the central station, forces, by means of a double-acting air-pump, compressed air into the reservoir P, and, at the same time, exhausts the air from V. The reservoirs are connected with the instruments *a* and *b* by two 8-inch pipes. By means of apparatus *a*, carriers are sent to distant stations. By apparatus *b*, carriers are received.

The different stations are connected by two lines of wrought-iron tubing having an internal diameter of 8 inches. Both lines are laid in the same trench, at a depth of about 12 inches below the pavement, and parallel to one another, as shown in the diagram. The tubes forming these lines are of an average length of 18 feet 8 inches. For turning round street corners, and for rising and falling in the different buildings, pieces bent to a radius of 12 feet are used. The ends of every two consecutive tubes are brought close together, and joined by means of a cast-iron "double collar," similar to those used for joining cast-iron water-pipes, but having in the centre of its length an annular projection 2 inches wide,

which is bored out so as to fit just over the ends of the tubes to make them butt true. A common lead and yarn joint is made at each end of the collar. Water-traps, communicating, by means of slots, with the bottom of the tubes, are placed at depressions on the line, to enable water, which may have got into the tubes through condensation, or otherwise, dust,

faces of the ends of the rocking frame and the sides of the bosses forming the ends of the machine. The three arms, springing from the central bosses of the ends, are connected together by means of three rods, E, E', and E'', with nuts, by which the distance between the faced surfaces of the two bosses can be adjusted. On the lower of these rods the rocking frame turns, whilst the other two serve to limit its motion to either side.

The rocking frame of the instrument consists of two tubes, F and A', having common flanges, *a a*, at each end, supported

on two bars, D D, the lower ends of which turn on the lower rod E joining the ends of the instrument, and the upper ends of which are joined by a horizontal bar forming a handle for moving the rocking part of the instrument, so as to bring one or other of the tubes in line with the tubes forming the circuit.

One of the tubes in the rocking frame, that called the "sending" or "through" tube, is simply a hollow cylinder of the same internal diameter as the tubes forming the circuit. When this tube is in line with the main tubes, a carrier can pass through the instrument without being stopped, and this tube is used when it is desired to put carriers into the circuit. The other, or receiving tube A', has a perforated diaphragm at its down stream end, so as to arrest the carriers when it is placed in line with the main tubes of the circuit. It is D-shaped in section, with a flat cover, which can be taken off if required; as for instance, to remove carriers, should two arrive at once, and so prevent the rocking frame being moved. The flat cover of the receiving tube is furnished with a pane of glass, to enable the attendant to see when a carrier has arrived.

To prevent the continuous flow of air in the whole system of tubes from being impeded, should the receiving tubes be left in circuit after it has caught a carrier, which would necessarily prevent the free flow of air through the perforated diaphragm, a by-pass, G, is provided, communicating with the tubes of the circuit, A and A', on both sides of the instrument. In this by-pass, there is a throttle valve, H, opened and shut by tappets on the rocking frame in such a manner that the throttle valve is shut when the sending or through tube of the rocking frame is in circuit, and is open when the receiving tube is in circuit. A sliding rod, held on supports, L L, and moved by the handle, K, is provided for pushing the carriers out of the apparatus when intercepted.

The manipulation for sending and receiving carriers by the apparatus is exceedingly simple. To send off a carrier, the attendant has merely to push the rocking part of the apparatus from him, place the carrier in the sending or through tube, and then

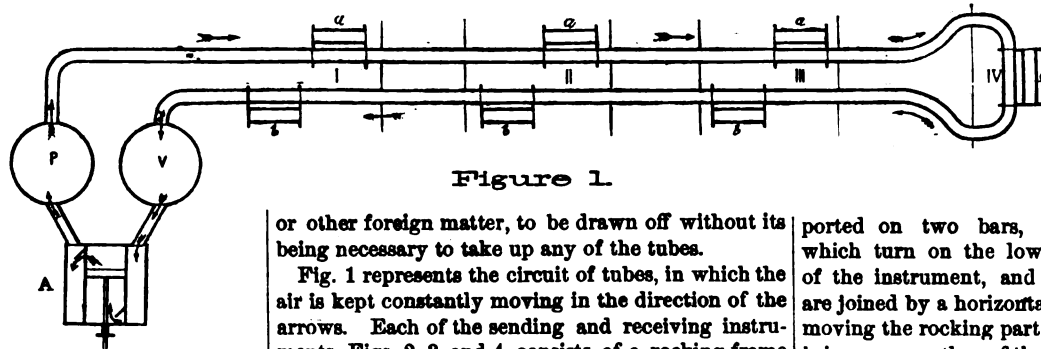


Figure 1

or other foreign matter, to be drawn off without its being necessary to take up any of the tubes.

Fig. 1 represents the circuit of tubes, in which the air is kept constantly moving in the direction of the arrows. Each of the sending and receiving instruments, Figs. 2, 3, and 4, consists of a rocking frame with faced ends, which rocks on one of three tie-rods, E, holding together the ends of the apparatus. These ends are made of cast iron, and consist of a central boss with three arms.

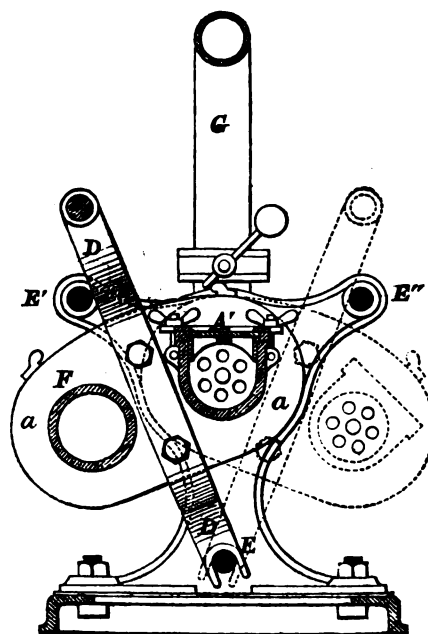


Figure 2

Into one side of the boss is fixed a short piece of the ordinary tubing composing the circuit; the other side is faced at right angles to the axis of the tubes entering and leaving the instrument. In the faced portion of the boss, three annular grooves are turned concentric to, and surrounding the hole forming the end of the tubing by which the carriers enter and leave the machine; these grooves have the effect of preventing the escape of air between the faced sur-

pull the handle towards him again, bringing the through tube into circuit, when the carrier is moved off by the current of air. To stop a carrier, the action is the same. The attendant pushes the handle from him, so as to put the receiving tube in circuit. He then, as soon as the carrier arrives, pulls the handle towards him, thereby bringing the receiving tube out of circuit, and by the same motion placing the through tube in the circuit ready for through traffic. The carrier is then knocked out of the receiving tube by means of the sliding rod provided for the purpose. To make the rocking frame easier to work, the apparatus is provided with treadles, by which the attendant can move the slides with his foot.

Station IV, and back through δ Station III, δ Station II, to δ Station I, where it is intercepted. In like manner if a carrier is put into the circuit at any one of the intermediate stations, it will traverse the whole length of the line between the station where it is put in and Station I, and be caught by δ Station I, unless the receiving tube of the apparatus at some intervening station is switched into the circuit to intercept it. The working of the line is controlled by electric signals, the station wishing to send a carrier signalling the letter or letters representing the station for which the carrier is intended.

Mr. Culley, Chief Engineer of the Post-Office Telegraphs, has adopted the block system, such as is used on railways, for the existing circular line, and employs

carriers in and take them out of the circuit without confusion.

The length of line now working in London is as follows: From the instrument room, situated on the third floor of the Central Telegraph Station, Telegraph street, to the General Post-Office, St. Martin's-le-Grand, 852 yards. From St. Martin's-le-Grand to the Telegraph Office in Fleet street, near Temple Bar, 1,206 yards. From the Fleet Street Office to the West Strand Office, near Charing Cross, 1,387 yards. The circuit consists of two tubes, forming up and down lines. The total length of the circuit from Telegraph street to the West Strand Office and back is therefore 6,890 yards.

Several experiments were made, before the last

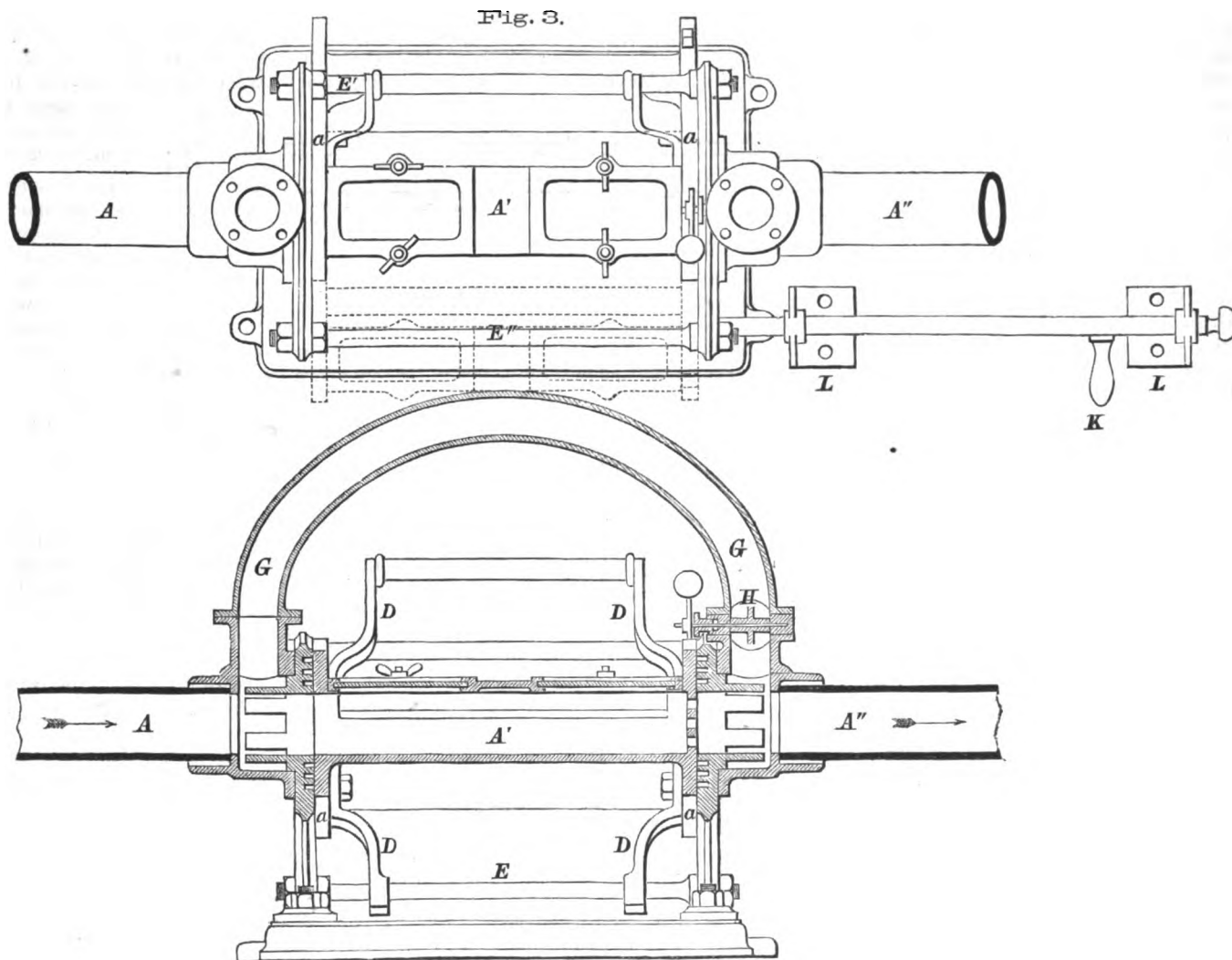


Fig. 4.

The carriers for the reception of telegrams, letters, or light parcels, consist of small cylinders made of gutta-percha, papier-maché, or tin, closed at one end, and with a lid at the other. They are covered with felt, drugget, or leather. The front ends of the carriers are provided with a thick disc of drugget or leather, fitting the tubes loosely, and the opposite ends are surrounded with a piece of drugget or leather attached to them like the leather of an ordinary lifting-pump, and fitting into the tubes in the same manner as a pump-leather fits into the barrel of a pump, but not so closely, as a good fit is not found necessary.

If such a carrier is placed in the circuit by means of the switch a , Station I, Fig. 1, it will be carried by the current of air in the direction of the arrows, and will pass through a Station II, a Station III,

instruments introduced by Mr. Tyer for making the signals. To enable the attendant to know when a carrier has passed his station through the "through" tube of his instrument, Mr. Culley has had a small lever arranged in the tube, which is raised by the passing carrier, and strikes a bell.

The use of the block system prevents the tubes being able to develop their full working powers which would be obtained by sending carriers one after another, at half-minute or shorter intervals—a mode of working which could be easily carried out if a constant current of air could be depended upon, as is the case when the circular system is worked independently of other systems, which is not yet the practice in the metropolis. The working power of tubes, arranged on the circular system, is practically only limited by the power of the attendants to put

section was completed, to find out the time occupied by carriers in traversing the two sections then in use. The mean pressure during the experiments was 7 lbs. per square inch at one end of the circuit, and the vacuum at the other end of the circuit was 11 inches of mercury; under these conditions, the tubes being worked with both pressure and vacuum, the times were:

		m.	s.
Telegraph street to General Post-Office.....	852 yards.	1	54
General Post-Office to Temple Bar.....	1,206 "	2	28
Temple Bar to General Post-Office.....	1,206 "	2	10
General Post-Office to Telegraph street.....	852 "	1	13
Totals.....	4,116 "	7	45

With the circuit working with vacuum only, the vacuum averaging 14.25 inches of mercury at one end, the other end, or what was the pressure end be-

fore, being left open to the atmosphere, the times were:

	m.	s.
Telegraph street to General Post-Office.....	853	3 48
General Post-Office to Temple Bar.....	1,206	3 25
Temple Bar to General Post-Office.....	1,206	3 43
General Post-Office to Telegraph street.....	853	1 27
[Totals.....	4,116	10 28

The total circuit of 4,116 yards was then worked on the old system—i. e., the line was disconnected, and both ends opened to the atmosphere, so that the air in the tubes came to rest. A carrier was then inserted at one end of the circuit, and the time taken from the moment the other end of the circuit was put into communication with the vacuum reservoir. The carrier, under these circumstances, took thirteen minutes and a half to travel the whole circuit, or nearly three minutes longer than when the circuit was worked with the same vacuum, but the column of air kept in movement, and within one minute of being twice as long as when both pressure and vacuum were used. The loss of time in the last experiment, as compared with the second experiment, is easily explained by the fact that a great portion of the air in the tube had to be exhausted before sufficient vacuum was produced in the far end of the tube to set the carrier in motion.

These experiments show that the speed of the carrier is much greater as it approaches the vacuum end of the tube than at the other end. For instance, the carrier took forty-one seconds more time to go from Telegraph street to the General Post-Office than it did on the way back, showing that it traveled fastest in the lighter or more rarefied air.

The necessity of having a steam-engine with air-pumps and reservoirs is a great hindrance to the general introduction of pneumatic tubes. There is generally no space to spare in post-offices for the erection of steam-engines, and, besides, the prime cost of the engine is often more considerable than that of the tubes, unless they are of great length.

This inconvenience has been successfully removed by the construction of an exhausting apparatus working by the direct action of steam upon a current of air; which exhauster will now take the place of the engine, air-pumps, and reservoirs.

Fig. 5 represents such an exhauster in section; the pipe on the right side is connected with the steam boiler, and the pipe on the left side with one end of the pneumatic circuit. The steam issues from the nozzle, in the form of a hollow cylinder, through the annular opening *a a*, having a width of about a millimetre. The steam issuing in this form has the greatest possible surface, both inside and out, for contact with the air in the apparatus, which air is thus forced upwards in the direction of the arrows and draws the air out of the pneumatic tubes. The funnel of the apparatus increases gradually in size from a short way above the nozzle, thus giving more room for the mixed air and steam to expand, and thereby facilitating the flow of air from the pneumatic tubes.

By carefully proportioning the area of the annular steam orifice, the areas of influx and efflux, the length of the mixing chamber and the increase of the expanding column, the steam is made to exert its expanding power very effectually, and a vacuum equal

to a column of 28 inches of mercury is obtained with a less expenditure of steam than would be required to work a steam-engine and pump to effect the same object.

Thus an exhauster of this description, with an annular orifice equal to 1, 2, 3, and 4 millimetres in width, was made to exhaust air from a closed receiver of 250 cubic feet capacity.

The principal recommendation of the steam exhauster, besides its great simplicity and the small space it occupies, is the cheapness of its construction and maintenance, as the cost only amounts to about one-twentieth of that of an engine and pumps.

To work a circuit of pneumatic tubes, such, for instance, as that between Telegraph street and Charing Cross, with an exhauster, it is only necessary to substitute the exhauster in place of the vacuum chamber, and to leave the other end of the line open to the

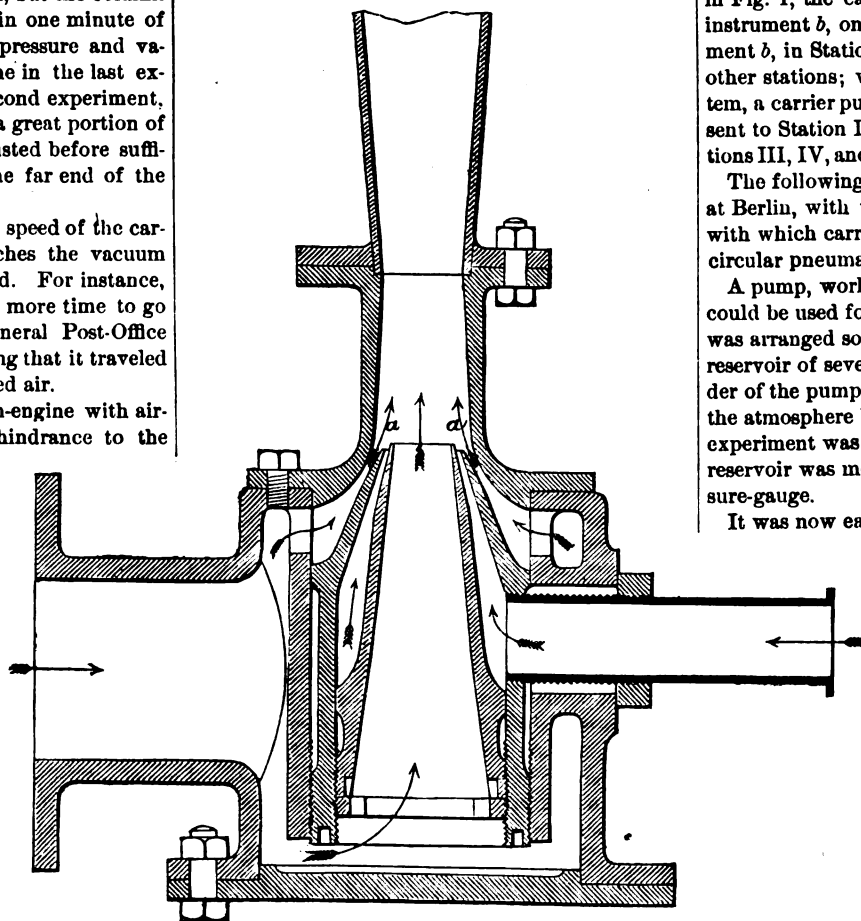


FIG. 5.

atmosphere. With such an arrangement, the apparatus for sending carriers from the end station can be done away with, as the carriers have simply to be put into the open end of the tube. It has been calculated that a carrier will take twenty-one minutes fifty-one seconds to traverse the whole line under a vacuum represented by 11 inches of mercury. In order to shorten the time, it would be advisable to divide the line at Charing Cross, and put a second exhauster there. In this way, the up and down lines would each have their own exhauster, and the boiler, which would have to be set up at Charing Cross, could be made to work other lines starting from that station. With a vacuum representing 11 inches of mercury, maintained by such an exhauster, a carrier would travel, according to calculation, from Telegraph street to Charing Cross, or *vice versa*, in seven minutes forty-three seconds.

An advantage, which is gained by working by vacuum only, is that condensation in the tubes which sometimes, in damp weather, takes place to an inconvenient extent when working with compressed air, is avoided.

Owing to the large traffic expected on the existing line, the Post-Office authorities had the tubes composing the up and down lines laid in the same trench, each station being supplied with two sending and receiving instruments, one placed on each tube. Where so much traffic is not expected, tubes laid on a large circuit could, at a comparatively small addition to the prime cost, be made to include many more intermediate stations.

The difference in the working of the two systems will be explained by the following example. Suppose Station II on each of the systems wishes to send a carrier to Station I. In the case of the system shown in Fig. 1, the carrier would pass directly from the instrument *b*, on the up line at Station II, to instrument *b*, in Station I, without passing through any other stations; whereas, on the other circular system, a carrier put into the circuit at Station II, to be sent to Station I, would have to pass through Stations III, IV, and V, before arriving at its destination.

The following are the experiments that were made at Berlin, with the view of determining the rates with which carriers can be made to travel through circular pneumatic tubes.

A pump, worked by a crank and fly-wheel, which could be used for either exhausting or compressing, was arranged so as to pump air into or out of an air reservoir of several times the capacity of the cylinder of the pump. The reservoir communicated with the atmosphere by means of the tube on which the experiment was to be made. The pressure in the reservoir was measured by means of a mercury pressure-gauge.

It was now easy to keep the pump going at such a speed as to preserve the pressure or vacuum in the reservoir constant, proving that the same amount of air was being pumped into or out of the reservoir as was passing through the tube being experimented upon.

The tube terminated, at the end farthest from the reservoir, in a carefully constructed gas-meter, which indicated exactly the amount of air passing through the tube in a certain time. The quantity of air measured in a certain time by the meter, divided by the sectional area of the tube, gave the speed with which air of atmospheric density either entered the meter from the tube when the air was compressed in the reservoir, or entered the tube from the atmosphere through the meter when the air in the reservoir was rarefied. As the same amount of air must necessarily flow in the same space of time out of one end of the tube as enters it at the other, it is easy, the pressure in the reservoir being known, to calculate by means of Mariotte's law, the speed at which the air either enters or leaves the end of the tube farthest from the meter. For instance, suppose the air in the reservoir to have been exhausted by half an atmosphere, and the speed of the air at atmospheric density at the entrance of the tube to be equal to 50 feet per second; then, as the same quantity of air must enter the reservoir as enters the tube, and as it enters the reservoir at half the pressure, it will take up double the volume, and therefore its speed will be equal to 100 feet per second.

The speed at different places along the tube could also be determined by measuring the density of the air at the different places. By repeating these experiments with tubes of equal lengths and different diameters, and tubes of equal diameters and different lengths, the influence of length and diameter of the tubes on the speed of the current of air was arrived at, and the following formulæ were obtained:

$$\text{I. Mean velocity } v' = \frac{v' + v''}{2}.$$

$$\text{II. Final velocity } v' = a \cdot \frac{h - h_1}{h} \cdot \sqrt{\frac{d}{l}}$$

$$\text{III. Initial velocity } v'' = a h_1 \left(\frac{h - h_1}{h^2} \right) \cdot \sqrt{\frac{d}{l}}$$

$$\text{IV. Velocity at distance } x \text{ measured from the beginning of the tube: } v = a \cdot \frac{(l-x)h_1 + xh}{l} \cdot \frac{h - h_1}{h^2} \cdot \sqrt{\frac{d}{l}}$$

$$\text{V. Mean velocity } v' = a \cdot \frac{h^2 - h_1^2}{2h^2} \cdot \sqrt{\frac{d}{l}}$$

where l — the length of the tube,
 d — its inner diameter, $\left\{ \begin{array}{l} \text{Either in inches, feet, or metres.} \end{array} \right.$

h — the pressure of the air entering the tube,
 h_1 — the pressure of the air leaving the tube,
 $h - h_1$ — the effective pressure,
 a — a constant. $\left\{ \begin{array}{l} \text{Either in atmospheres, lbs. per square inch or inches of mercury.} \end{array} \right.$

The experiments, however, proved these formulæ to be but approximately right. The mean velocity of the air increases practically faster than the square root of the diameter of the tube. This difference is probably owing to a layer of air being retained by molecular attraction on the inner surface of the tube, thereby decreasing its diameter; the fact that this occurs should be taken into consideration when the tubes to be employed are of small diameter.

The constant a given in the above formulæ, and which depends on the nature of the inner surface of the tubes, was found to equal 15950. By making use of this constant, in calculating the velocity of the air in a tube 18,000 feet long and 3 inches in diameter, with a difference of pressure of one atmosphere between the two ends, there result—

- 1) With one atmosphere of pressure,
 $i. e. h = 2$.
 $h_1 = 1$, a mean velocity of 26.2 feet per second.
- 2) With a vacuum of one atmosphere,
 $i. e. h = 1$.
 $h_1 = 0$, a mean velocity of 35 feet per second.
- 3) With a pressure of half an atmosphere and a vacuum of half an atmosphere.
 $i. e. h = 1\frac{1}{2}$.
 $h_1 = \frac{1}{2}$, a mean velocity of 31.1 feet per second.

The foregoing prove that, in very long lines of tubes of small diameter, a sufficient velocity of the column of air can be obtained with the pressure at the two ends differing within quite practical limits. If the carrier is made so as to move with very little friction, its speed will be nearly equal to that of the column of air by itself. The momentum of the carrier, and that of the column of air, may be entirely disregarded, as both are infinitely small when compared with the prevailing friction of the air in the tube. It would be different if the carrier required any considerable force to move it, as in that case the air would become much denser behind than before

the carrier, and a loss of speed would result. The requirements of each case should determine the dimensions of the tubes. As under equal conditions of pressure at the two ends, the speed in the tube increases as the square root of the diameter, and decreases as the square root of the length of the tube, the length of a pneumatic system may be extended with similar results as to speed in the same proportion as the diameter of the tubes can be increased: that is, the same speed as is obtained through a tube of a certain diameter and length may be obtained through another of double the length and double the diameter, the difference of the pressures at the two ends of the tubes remaining identical.

The value of $a = 15950$ found by these experiments is only correct for the comparatively smooth surface of lead tubes.

To find the speed of a carrier passing through the wrought-iron tubes of the pneumatic circuit in London, it is necessary to determine the value of a for these tubes. With a pressure of 7 lbs. per square inch, and a vacuum represented by 11 inches of mercury, the carrier completes the circuit from Telegraph street to Temple Bar and back in seven minutes forty-five seconds — one hundred and sixty-five seconds. Thus—

$$v' = a \cdot \frac{h^2 - h_1^2}{2h^2} \cdot \sqrt{\frac{d}{l}}$$

where $h = 44$, $h_1 = 19$, $l = 12,168$ feet, $d = .25$ of a foot: thus the value of $v' = 6 \cdot 168$, and of $a = 14192$.

Taking the above into consideration, the completion of the carrier's passage through the whole circuit, from Telegraph street to Charing Cross and back, will take (l being 21408 feet) eighteen minutes five seconds if the same pressure and vacuum are made use of as before.

A carrier takes two hundred and sixty-two seconds to go from Telegraph street to Temple Bar, but only two hundred and three seconds for its return. Under these circumstances, a carrier will take ten minutes eleven seconds from Telegraph street to Charing Cross, and seven minutes fifty-four seconds only for its return to Telegraph street.

Up to the present time, as far as the public is concerned, the pneumatic tubes in London, Berlin and Paris have only been used for the conveyance of telegraphic messages, but the British Post-Office authorities have already considered the question, whether it would not be advantageous to have the letter-post service, in London, executed by means of pneumatic tubes; and as the advantages of such a mode of conveyance would undoubtedly be very great, it appears probable that, if once established, it would soon be extended, upon a comprehensive scale, as the ordinary means for the distribution of letters throughout the metropolitan districts. With such a system of distribution, an accumulation of letters at principal offices would be entirely avoided, and the actual delivery of every letter could easily be effected within an hour of the time of its being posted, at a cost certainly not exceeding that of the present arrangement for collecting, assorting, and re-distribution by means of foot carriers and postal carts.

No PLACE.—A great many boys complain that there are no places. Perhaps it is hard to get just such a place as you would like. But when you get a place, and there are places, this big country, we are sure, has need of every boy and girl, and man and woman, in it—when you get a place, we say, make yourself so necessary, by your fidelity and good behavior, that they cannot do without you. Be willing to take a low price at first, no matter what the work, if it be honest work.

CORRESPONDENCE.

IMPROVEMENTS SUGGESTED.

MOBERLY, Feb. 1, 1874.

To the Editor of the Journal of the Telegraph:

Would it not be a great stroke of economy on the part of the management of the W. U. T. Co. should they manufacture register books and check ledgers of smaller size than have ever been sent out. The register books we receive are 6-quire books, and last an office doing a business of \$125 per month just two years, by which time, even in the hands of a careful man, they are entirely out of the binding, and almost useless as a record. I requested some time since that small register books be sent me for use at small R. R. offices, where the telegraph receipts amount to \$10 per month, or less, but have not received any yet. The present 6-quire register book will last one of my largest offices two years, and the binding is not good enough for that length of time.

I have about 40 offices where one of present books would last ten years if it would hold together, but about two years' service finishes them.

An improvement in the form of these books is also desirable. To the position of the columns for "Local Cash," "Other Lines," &c., is due, in my opinion, the greater portion of the check errors which are now so numerous. S. C. MASON.

ECONOMY OF THE CALLAUD BATTERY.

LEWES, Del., 1874.

To the Editor of the Journal of the Telegraph:

I think it likely that a few items as to the Callaud Battery may be of interest, and present herewith.

During the year ending Dec 31, 1873, I have used 97 lbs. sulphate of copper. Of this not less than 20 lbs. have gone to locals (two locals were run for some weeks during the Winter), leaving 77 lbs. consumed by main battery of 35 jars, or about 35½ oz. per jar.

The cost of acids for same number of carbons per year at this office has been at least \$50, 42 cups averaging about \$60. Jars and zincs have been undisturbed the entire year, save to replenish and to cut off the copper strings depending from zincs.

On Saturday, Jan. 3d, I cleaned several zincs thoroughly; found them uniformly worn, and reduced to 13 oz. each. Have no means of determining exact proportions wasted, but judge full two-thirds of available material has been consumed.

W. E. BINGHAM.

OWEGO, N. Y., Feb. 5, 1874.

To the Editor of the Journal of the Telegraph:

Will you please state in your issue of Feb. 15, for the benefit of such offices as may have check errors to settle with this office, that, owing to the sudden aspirations of a barrel of gasoline, kept by the sandwich and pie vender in the adjoining room, the Erie Railway Depot was destroyed by fire on the morning of Jan. 25, and all our books, files of messages, and the JOURNAL up to that date, were consumed, and I shall be unable to give any information relative to differences in checks, either in paid or free business, prior to that date.

However, to such as wish to consult my *superior memory*, I will say that inquiries, accompanied by a three cent stamp, will be responded to with my usual alacrity and explicitness.

In this sudden mix-up of affairs, I wish to extend my regards and sympathy to my worthy friend Tuttle of Oswego, N. Y. office, who so truly exemplifies the golden rule in his promptness to father those mysterious credits which have so frequently confronted

A. S. PARMELEE, Manager.

HIGHSPIRE, DAUPHIN CO., PA., Feb. 5, 1874.

To the Editor of the Journal of the Telegraph:

I notice a communication in JOURNAL of January 15, 1874: "Which is correct in a message, I will go or I will come, in answer to an inquiry, Will you come?" Your answer is, "I will go," and refer to Webster's Dictionary. Now I contend things are a little mixed; according to Webster *go* signifies to depart, and *come* to move toward. So, according to your answer, if I were to ask you, "will you come?" would you say, "I will go," or if I would say, "will you go?" would you say "I will come." I think the answer should be to the first, "I will come," to the second, "I will go." M. J. STONER.

WOLCOTTVILLE, Conn., Jan. 28, 1874.

To the Editor of the Journal of the Telegraph:

I have often wondered why the Telegraph Company did not send fly leaves to paste into Tariff Book. I have just written up JOURNAL of Jan. 15, and find I have had to make 12 new leaves in all up to this time, and shall soon have to make 6 more. Printed fly leaves could be put in neatly, making a much better looking Tariff Book than what we now have. I think I have seen this matter suggested in the JOURNAL. I have written to our Superintendent about it once or twice. For my part I wish they would do it. C. McNEIL, Manager.

To the Editor of the Journal of the Telegraph:

I have found the following device serviceable, and therefore send it to you for the benefit of all interested. It may happen that a person desires to work a relay on the same circuit with a sounder. Now, by connecting a relay and sounder in the ordinary way, the sounder will be very little affected by the current; but if he proceeds as follows, it will greatly improve the working of his sounder, and will not materially weaken the relay.

Untwist the wires on the relay which join the two helices (being careful not to break them). Run the inside wire from one helix to the binding post to which the outside wire of the other helix is connected. The current will then divide at the binding post, part of it going through one helix, and the remainder going through the other. Now, suppose the resistance of the relay, as ordinarily connected, to be 100 ohms, connected in this way the joint resistance would be

$$\frac{50 \times 50}{50 + 50} = 25 \text{ ohms.}$$

A good point in this arrangement is, that the relay can be changed to its original arrangement, and used on a long line in a few minutes.

M. A.
X.

WYOMING, Ill., Jan. 29, 1874.

To the Editor of the Journal of the Telegraph:

Please answer through the JOURNAL the following: A town has two business centres a half-mile apart. Each centre has a telegraph office, both W. U. Is the manager of either office required to deliver without charge, messages addressed to parties whose place of business or residence is over half-a-mile from his own office, and yet is within the limits of free delivery from the other office? You will greatly oblige by answering. H. J. B.

P. S.—The offices are not connected.

Answer.—No charge for delivery should be made in a case of this nature, which, we suppose, could only arise from an interruption of the wires connecting one of the centres. Otherwise, the message would be sent by telegraph to the proper point.

KANSAS CITY, Mo., Jan. 19, 1874.

To the Editor of the Journal of the Telegraph:

Are the resistance boxes furnished with Stearns' Duplex apparatus correct B. A. Units? That is, can they be used for measurement with a Tangent Galvanometer? R. J. HEWETT.

Answer.—They are approximately correct, not absolutely.

VENICE, Ill., Jan. 24, 1874.

To the Editor of the Journal of the Telegraph:

Has there ever been an attachment, to use with relays, introduced that has proven successful, by which an operator could tell by sight if the line was being used by any other operator, whether he had his own instruments adjusted or not—thereby avoiding so much breaking in bad weather? Please answer at earliest convenience, and greatly oblige M. M. DARR.

Answer.—We know of no such attachment. Nor should it be necessary. See Rule 25, Book of Regulations.

AUGUSTA, Ga., Feb. 4, 1874.

To the Editor of the Journal of the Telegraph:

For information of several, please inform me how many words in each of following messages:

- 1st. New York Middlings, seventeen.
 - 2d. Will leave by New York steamer.
 - 3d. Stop at New York Hotel.
 - 4th. Liverpool, fourteen; New York, fifteen.
- See Rule 9.

AUGUSTA (GA.) OFFICE.

Answer.—New York is two words in each of the above.

TICKFAW, Jan. 21, 1874.

To the Editor of the Journal of the Telegraph:

Please answer through the JOURNAL the following simple question, as I cannot find any "one in these woods" who can tell me: Will it injure a relay to work it in a local circuit, to practice on, for instance? RURAL IGNORANCE.

Answer.—No injury would ensue to a relay by working it in a local circuit with a battery proportional to the resistance of the coils. Injury could arise only from the use of a too powerful battery heating the wire.

BUFFALO, N. Y., Jan. 15, 1874.

To the Editor of the Journal of the Telegraph:

Official decision is respectfully requested on following questions:

1st. If a party sending a prepaid message fails to receive an answer within reasonable time, and asks us to procure one, or manager's notice of delivery, can we send a service message requesting answer, or assurance of delivery (either or both), on condition that full tariff is collected on the reply to the service message?

2d. Does the prohibition [of service messages regarding non-delivery, etc., include service messages from other lines. A Montreal Tel. Co.'s office desiring answer to a message would, under the rules of that Co., send a message as follows:

"To JOHN SMITH, 88 Broad street, New York: Please answer Jacob Smith's message of to-day.

"Signed TORONTO OFFICE."

Should we refuse such messages from other lines?

J. W. TILLINGHAST, Manager.

Answer.—1st. There is no authority at present for the performance of such service.

2d. It does. Business for which payment is required from the customers of the Company cannot be transmitted free for those of another.

BRINKLEY, Ark., Jan. 22, 1874.

To the Editor of the Journal of the Telegraph:

Will you please explain to me through the columns of the JOURNAL for February, if a line twenty-five yards in length, with a key and sounder at each end, can be worked without relay or cut-off; and if so, how must I attach the wires? By giving an explanation of this, you will oblige PHELPA.

Answer.—Yes. Connect a ground wire to one pole of the battery; from the other pole carry a wire to one of the key posts; connect the other key post to one of the binding screws on sounder, and insert the line wire in the remaining binding screw. At the end of the line no battery will be needed. Connect the ground wire there to one of the key posts; other connections same as at first.

To the Editor of the Journal of the Telegraph:

Can you recommend to me any work on Electrical Measurements that treats in full of all the different methods? I have Clark's, but it seems to be intended mostly for the Differential Galvanometer. Please answer through JOURNAL, and oblige BROWN AYRES.

Answer.—We know of no one work which fills this requirement. The works of Culley, Noad, and Haskins, in addition to Clark's, would probably afford a complete understanding as to the different methods of measurement known.

To the Editor of the Journal of the Telegraph:

Will you please have the kindness to give me an estimate of the proportion between male and female operators in this country? Some parties, not connected with our business, having a discussion on this subject, called on me for decision, but I had to confess my ignorance in the case. "Sr."

Answer.—We think that about five per cent. are females.

Cincinnati.—The battery used to operate an electric car brake is usually a form of the bi-chromic. It is carried on the train. The shaking received in travel is said to improve its action. The liquids of this battery contain a very large percentage of acid, which probably is the reason why it has never yet frozen at the lowest temperature to which it has been exposed. Had you given your address we could have sent you a pamphlet with complete information.

W. H. W.—Any amount overpaid to the Company will be refunded upon proper representation and rendering of proof.

A. T. R.—Apply for a situation as operator to any superintendent. If you are competent, you will have no trouble in obtaining a position.

Max.—The titles, M. D., D. D., L.L. D., or any other suffix to a signature, should be counted as part of the message. See Executive Order No. 150. To your other inquiry, see reply to Clericus, JOURNAL Oct. 1st, 1873.

Geo. R. Stanley.—There are so many standard works upon telegraphy, all claiming to be complete, and all certainly good, that we hesitate to say which is the best. An American operator would probably derive the most benefit from Prescott's History, Theory and Practice; or from Pope's Modern Practice. Price of Prescott's Work, \$2.50; Pope's, \$2. They can be procured for you through this office if you so desire.

J. A. H.—Pay-roll is one word.

THE sale of six months collection of old paper, chiefly from the central office of the W. Union Tel. Co., 145 Broadway, N. Y., realized \$1,168.50.

FOREIGN TELEGRAPHIC ITEMS

PLAN FOR A NEW ATLANTIC CABLE.

LONDON, Monday, Feb. 9, 1874.

The organization of a new company to lay a light cable from the coast of Great Britain to Halifax, via the Azores Islands, is announced. The capital is £380,000, and the prospectus, which was opened on Saturday, says it is the intention of the company to convey messages over its cable at the rate of one shilling per word.

THE *Railway News* considers that the proprietors of the Sheffield, as of several other railways, have still continued cause of complaint of the dilatory conduct of the Post-Office authorities in settling the claims upon them for the telegraphs taken over by them from the railways. We would commend the following, from the report of the directors, to the consideration of those who profess implicit faith in the business-like conduct and *bona fides* of a Government department:

"The Post-Office authorities continue to throw every obstacle in the way of any legal or equitable settlement of the claims of the railway companies for the telegraphs, and the directors desire to record their strong protest against the injustice you suffer in common with many other companies in being so long kept out of what is justly due to you. In the case of the claim of the South Junction, in which company you hold half the capital, the Marquis of Salisbury awarded the sum of £8,479. It will scarcely be believed that the Post-Office authorities refuse to accept the award, and leave the company to contest their claim in a court of law, after having caused them and the country to incur costs of probably £8,000 in a court of arbitration, a tribunal agreed to by themselves, and under sanction of an Act of Parliament."

WHEN the Telegraph was first established in Salvador, Central America, in 1870, the Government passed some severe orders, that any one injuring the posts or wires should be punished; although several cases have happened when telegraph appurtenances have been injured, no one has been found culpable. Yet, in the house yards of San Vicente, Teocoluca, Usulután, and Jucuapa, pieces of the wires may be found being used to dry wash clothes on. So much is this the case, that it is almost impossible to keep the line open above a few hours.

THE Bishop of Pampaluna, in Santander, Bogota, has given his blessing to the Electric Telegraph there, and in his address to the people, begged them to respect the invention as being necessary for the progress of society.

THE earnings of the Atlantic cables for the past year are, it is stated, £753,000, while for the year 1873 the receipts were £689,000, thus showing an increase of £64,000.

THE total number of messages forwarded from postal telegraph stations in the United Kingdom, during the week ended the 10th of January, 1874, and during the corresponding week of 1873, were respectively: Week ended January 10, 1874, 813,696; week ended January 11, 1873, 275,841. Increase in the week of 1874 on that of 1873, 538,855.

THE total number of messages forwarded from postal telegraph stations in the United Kingdom during the week ended the 17th of January, 1874, and during the corresponding week of 1873, were, respectively: Week ended January 17, 1874, 828,946; week ended January 18, 1873, 288,679. Increase in the week of 1874 on that of 1873, 540,267.

MORE "BOGUS" CABLES.

For some time past there has been a reappearance of the now familiar rumors as to the construction of light submarine cables at a fabulously low cost, to be laid to the United States, and to conduct the largest possible amount of business in the shortest possible time, and, generally, speaking, to revolutionize the whole system of submarine telegraphy. From past experience of similar rumors, we are not surprised to find that, having answered the purpose of their originators in more or less depreciating existing cable property, the projects vanish into the thin air from which they have been evolved. The experience of one of these schemes which really attained to some consistency is not such as to warrant alarm on the part of holders of cable securities. Our readers may remember that, a short time since, some gentlemen reputed to be eminent citizens of the United States met in conclave, and decided that one of the wants of the age was an independent cable between New York and London, and thereupon they magnanimously resolved that they would give their names as an American board, provided an English company would go through the formality of raising funds and laying the cable in question. The result was the United States Direct Cable Company, which offered the usual glowing prospects to the investing public. Investors did not appear to respond with customary eagerness, but we believe, in spite of discouragement, the cable has been taken in hand. When it will be completed, however, and, still more, when it will be successfully laid, are points on which we should be very unwilling to hazard a decided opinion. The shares of the company are practically unsalable, but are quoted nominally at 6 discount. The proprietors, indeed, appear to have possession in their unfinished cable of something equivalent to a white elephant, and would be greatly obliged to any enterprising company who would take it off their hands, for it is stated that mature consideration of their ill-advised project has disclosed the fact that a cable such as they propose to lay between this country and New York would not, owing to its longer distance, have a carrying capacity equal to more than half of that of the existing lines between Valentia and Heart's Content. The position and prospects, on the whole, are not such as to encourage the support of competing cable projects. Although a great deal has been said in relation to light cables, we are not aware that a single one has yet been successfully laid, and considering the well-known risks which attend the laying and repairing the comparatively strong lines which connect this country and America, he would be a bold man who would venture to support experiments with light and weak cables.—*Railway News*.

THE Anglo-American Telegraph Company has declared a balance dividend of 2 per cent., being, with that previously paid, at the rate of 6 per cent. per annum for the eight months ended the 31st of December, 1873. The company, after the payment of this dividend, will remain with a cash balance of about £250,000, besides about 900 miles of spare cable.

THE directors of the Globe Telegraph and Trust Company have declared a dividend of 8s. per share, being at the rate of 6 per cent. per annum upon the preference shares of the company.

THE Eastern Telegraph Company have announced the opening of their new lines from Otranto, Italy, to Zante, Greece, and from Zante to the Island of Candia.

THE ELECTRIC TELEGRAPH AT THE GOLD COAST.

A large number of men of all color, castes and creeds are employed under the Royal Engineers in the construction of the land telegraph lines on the Gold Coast. Wherever it is practicable, trees are substituted for telegraph posts without cutting them down. By means of the light wire and small insulators sent out from Henley's Telegraph Factory at North Woolwich, these men, with no other tools than a light ladder, large gimlet, a hand-saw and axe, can complete six miles of line per day, when the way is tolerably clear through the bush. The number of insulators and tree posts per mile varies according to the nature of the ground. The average on level ground is eighteen intermediate and three straining posts per mile, which makes a span of eighty-four yards, and on hilly and difficult ground there are as many as twenty-six posts to the mile, and in exceptional instances there are spans of 200 yards. The telegraph apparatus employed in the Gold Coast expedition against the Ashantees is the invention of Sir Charles Wheatstone, and is contained in a compact box, 13 in. long, 8 in. broad, and 7 in. deep, the weight of the whole being under 25 lbs. The electric power is derived from a permanent magnet within the instrument, a constant series of currents from which is obtained by a rotation of a small iron armature placed before its poles and turned by a handle in front. The signals are made by successive depression of lettered finger keys arranged round the dial plate. By means of these instruments camp and field messages can be transmitted at the rate of twenty words per minute a distance of 100 or 200 miles. The object in erecting the field telegraph is that of making known the enemy's position or numerical strength, to order arms and reinforcements from distant stations, and to control any military and strategic movements found necessary in the war on the Gold Coast with the Ashantees. It is the first time field telegraphy has been employed by the English in actual warfare.

THE *Herald* correspondent at Lima, Peru, states that the Congress of that country has granted a concession to a Spanish gentleman for exclusive monopoly in all telegraphic land and marine lines to be laid within the jurisdiction of the Republic. This will clash, in a measure, with the project of the Telegraph Works Company of London to lay a cable from Pisco, in Peru, to Caldera, in Chile, passing through Bolivian waters; but possibly some arrangement may be arrived at.

THE traffic receipts of the Submarine Telegraph Company for December, 1873, amounted to £7,798 against £7,466 for the corresponding month of the previous year.

THE total traffic receipts of the Great Northern Telegraph during the month of December last amounted to 287,137f. (£11,485), and for the month of December, 1872, to 204,752f. (£8,190). The receipts on the European lines amounted to 142,938f., against 106,294f. in December, 1872; and on the China and Japan lines to 144,198f., against 98,458f. in the month of December, 1872.

THE report of the Eastern Telegraph Company states that the directors have at length concluded a joint-purse traffic arrangement with the Indo-European Telegraph Company. The net revenue for the six months ended the 30th of September amounted to £122,826, and an interim dividend of 1½ per cent. on the 14th of October, and a further interim dividend of 1½ per cent. declared on the 7th ult., amounting together, with interest on new shares, to £99,932, leaves a balance of £32,893 to be carried forward.

TARIFF BUREAU.

SEMI-MONTHLY CIRCULAR.

EXECUTIVE OFFICE,
WESTERN UNION TELEGRAPH COMPANY,
145 BROADWAY, NEW YORK,
February 15, 1874.

To all Offices on W. U. Lines:

The following changes and additions have been made since the date of the last circular.

GENERAL INFORMATION.

Oxford, Ala., closed.
Manitou House, Colorado Springs, Col., closed. Business will hereafter be sent and checked to Colorado Springs.
Hereafter the "tariff for other lines" to Colchester, Conn., will be 25 and 3 from Norwich.
Palmetto, Ga., closed.
The P. O. A. of Breese, Ill., is *Shoal Creek*; of Hollis, Ill., *Orchard Mines*; and of Norrie, Ill., *Ipsedale*.
Mellville, Ill., closed.
Confidence, Ill., closed. Business will hereafter be sent and checked to Collinsville.
Rossville, Kas., re-opened.
The P. O. A. of Ridgeway Station, Mich., is *Ridgeway Sta.*, *Richmond P. O.*; and of Pine Run, Mich., *Ohio*.
Blocks, Mo., closed.
The P. O. A. of Beverly, Platte Co., Mo., is *Beverly, Weston P. O.*; and of Harris, Mo., *Harrison*.
Gallagher, Mo., closed.
Business for Elizabethport, N. J., will hereafter be checked to Elizabeth.
Hereafter the "tariff for other lines" to Kinderhook, N. Y., will be 20 and 1 from Valatie.
The P. O. A. of Gardner's Switch, Luzerne Co., Pa., is *Parsons, Luzerne Co.*
W. Chester Inters'n changed to Malvern. P. O. A. is *Green Tree*.
Brooklyn, Texas, changed to Forney.
The P. O. A. of Summit, Vt., is *Healdville*.
McKendree, W. Va., closed.

NEW OFFICES.

285 Cullman's, Ala.
Borden, Cal.
Gridley's, Cal.
557 Arapahoe, Col.
100 Gaylord's, Mich.
487 Hardin, Mo.
369 Pendleton, Mo.
130 Vermont, N. Y.
131 Kennedy's Station, Pa.
59 Malvern, Pa., P. O. A. is *Green Tree*.
59 Pomeroy, Pa.
123 Ursina, "
* Atlanta, Texas, 50 3 470 Marshall.
* Brookston, " 65 4 510 Sherman.
* Grand Saline, Texas, 65 4 470 Marshall.
* Lanark, " 50 3 470 "
* Brownstown, W. Va., 50 3 183 Huntington.
* 65 4 183 Greenbriar, W.S. Spgs., "
* Guyandotte, " 35 2 183 Huntington.
* 65 4 183 Greenbriar, W.S. Spgs., "
* Quinimont, " 65 4 183 Huntington.
* 50 3 183 Greenbriar, W.S. Spgs., "

On and after March 1, 1874, the "Tariff for Other Lines" from Chicago, Ill., to Hastings, Lake City, Minneapolis, Red Wing, St. Anthony, St. Paul, Stillwater, Wabasha and Winona, Minn., La Crosse and Prescott, Wis., will be that printed in the tariff book. All but a few W. U. offices are now using the printed rates. Offices now and formerly on "Special Sheet," however, still use a special rate of 55 and 4 from Chicago, Ill., to points named. This special rate is now to be discontinued, and all offices (except such as may be otherwise notified before March 1) will take the rate of the tariff book.

Hereafter no half-rate messages will be taken for, or received from, Owensboro, Ky.

ATLANTIC CABLE BUSINESS.

We are informed that the extra charge on Code and Cypher messages to Japan is abolished; hereafter the charges on such messages will be the same as for messages written in ordinary language. Messages to Persia are not accepted if written in Code or Cypher.

CUBA CABLE BUSINESS.

We are notified that messages may now be taken for the following points in South America. They will be forwarded by

mail at 25 cents postage for each message from St. Thomas to Para, in Brazil, and thence by telegraph to:
Pernambuco, \$0 50 per word.
Bahia, 0 75 "
Rio de Janeiro, 1 00 " in addition to the rate to St. Thomas.

WILLIAM ORTON, President.

EXECUTIVE ORDER No. 154.

EXECUTIVE OFFICE,
WESTERN UNION TELEGRAPH COMPANY,
NEW YORK, February 9, 1874.

In counting messages received from other lines no charge will be made for extra words unless such extra words, added to the body words, make a total of more than ten words—that is to say, the extra words in such message are to be treated as body words. Examples: If there were but six body words in the original message, and there are four extra words to be charged for, the message should be treated as containing only ten words; or if there were nine words in the body, and three extra words, our charge would be for twelve words.

WILLIAM ORTON,
President.

TO SUPERINTENDENTS, MANAGERS, AND ALL OTHERS
IN THE WESTERN UNION COMPANY'S SERVICE.

The President having directed the review of the rules of the Company, with a view to their simplification, modification and correction, as well as to add such as experience has shown to be necessary, I hereby, with his approval, invite all to mail to me, with such promptitude as may be possible, such criticisms and suggestions in reference thereto as their intelligent observation and experience may have proved to them to be needed. Let me ask clearness of statement and such brevity as an intelligent review of each case may permit.

JAMES D. REID.

New York, February 12, 1874.

TELEGRAPHERS' MUTUAL BENEFIT
ASSOCIATION.ACKNOWLEDGEMENT OF RECEIPTS FOR ASSESSMENTS
NOS. 53 AND 54, BETWEEN JAN. 27 AND FEB. 10,
INCLUSIVE.

19, 31, 51, 69, 104, 185, 186, 187, 294, 319, 347, 652, 692, 695, 907,
700, 705, 758, 766, 800, 994, 1071, 1134, 1135, 1136, 1139, 1277, 1278,
1279, 1289, 1400, 1439, 1459, 1504, 1511, 1536, 1557, 1570, 1598, 1599,
1600, 1601, 1603, 1604, 1605, 1606, 1607, 1608, 1613, 1620, 1639, 1641,
1642, 1643, 1646, 1653, 1655, 1657, 1669, 1670, 1689, 1690, 1691, 1692,
1722, 1726, 1727, 1741, 1778, 1779, 1807, 1827, 1832, 1833, 1834, 1835,
1836, 1854, 1910, 1930, 1933, 1934, 1945, 1946, 1947, 1957, 1978, 1980,
2030, 2025, 2063, 2064, 2066, 2117.

Nos. 49, 50, 51 and 52.—104, 1277, 1479, 1939, 2117.

Nos. 51 and 52.—1459, 1511.

AFTER the lapse of over three months since a death occurred in the Telegraphers' Mutual Benefit Association, notice has been received of the death of J. M. Worden, one of the earliest members, at Oxford, Ala.

BORN.

DE LONG.—At Mansfield, O., Jan. 21, 1874, a son to W. H. De Long, operator, P. F. W. and C. Ry., Mansfield.

DE MIER.—At Coulterville, Ill., Jan. 14, 1874, a son to John R. De Mier, Manager W. U. Tel. Office, Coulterville.

MARRIED.

MEYER—PFEIFFER.—At the residence of the bride's parents, Feb. 1, 1874, by Rev. Father Bosco, A. Leonard Meyer, operator and agent S. P. R. R., Santa Clara, Cal., to Miss Lizzie Pfeiffer of same place.

SCHUSTER—TURK.—At Harper's Ferry, W. Va., Thursday, Feb. 5, 1874, by the Rev. Joseph McFaden, George M. Schuster of the Commercial News Department, W. U. Tel. Office, New York City, to Miss Sallie E. Turk of Harper's Ferry.

NEW VALUES.

The Secretary of the Treasury has issued the following proclamation of the newly fixed valuation of foreign moneys (showing considerable alterations since the former publication) and instructions to collectors thereon:

VALUES, IN UNITED STATES MONEY OF ACCOUNT, OF THE PURE GOLD OR SILVER REPRESENTING THE MONETARY UNITS, RESPECTIVELY, OF FOREIGN COUNTRIES.

Country.	Monetary Unit.	Standard.	Value in U. S. Money of Account.
Argentine Republic	Pesofuerte.	Gold	\$1.00.00
Austrian	Florin.	Silver.	47.60
Belgium	Franc.	Gold and silver	19.30
Bolivia	Dollar.	Silver.	96.50
Brazil	Milreis of 1,000 reis.	Gold.	54.56
British Possessions in N. America.	Dollar.	Gold	1.00.00
Central America.	Dollar.	Silver.	96.50
Chili	Peso.	Gold	91.32
China	Tael.	Silver.	1.61.00
Cuba	Peso.	Gold	92.58
Denmark	Crown.	Gold	36.80
Ecuador	Dollar.	Silver	96.50
Egypt	Dollar of 20 piastres.	Silver.	1.00.59
France	Franc.	Gold and silver	19.30
Great Britain	Pound sterling.	Gold	4.86.65
Greece	Drachms.	Silver.	19.30
German Empire	Mark.	Gold	32.82
Hayti	Dollar.	Silver.	1.00.00
Jamaica	Pound sterling.	Gold	4.86.65
Japan	Yen	Gold	99.70
India	Rupce of 16 annas.	Silver	45.64
Italy	Lira.	Gold and silver	19.30
Liberia	Dollar	Gold	1.00.00
Mexico	Dollar	Silver.	1.04.75
Netherlands	Florin	Silver	40.50
Norway	Crown	Gold	36.80
Paraguay	Peso.	Gold	1.00.00
Peru	Dollar	Silver	96.50
Porto Rico	Peso	Gold	92.58
Portugal	Milreis of 1,000 reis.	Gold	1.08.47
Russia	Roubles of 100 c'p's.	Silver	77.17
Sandwich Islands.	Dollar.	Gold	1.00.00
Spain	Peseta of 100 centimes	Gold and silver	19.30
Sweden	Crown	Gold	36.80
Switzerland	Franc.	Gold and silver	19.30
Tripoli	Mahbub of 20 piastres	Silver.	97.09
Tunis	Piastre of 16 car'be.	Silver	12.50
Turkey	Piastre	Gold	94.39
United States of Columbia.	Peso	Silver	96.50
Uruguay	Patacon	Gold	94.98
Venezuela	Peso	Silver	77.78

NOTE.—Where silver is the legal standard, and represents the unit of account, its value is reduced to the basis of gold, on the assumption that the ratio of 15½ to 1 represents the relative values of silver and gold.

WILLIAM A. RICHARDSON,
Secretary of the Treasury.

PRESENTATION TO MR. E. P. ADAMS.

Mr. E. P. Adams, who for fifteen years has served the Grand Trunk Railway and Montreal Telegraph Company at Gorham, N. H., has been appointed Agent on the Central Pacific Railroad at Corinne, Utah. On the eve of his departure (December 24th) a goodly number of his friends, employes of the Grand Trunk Railway, and citizens of Gorham, surprised him at his office, where he was presented with a magnificent Swiss gold watch, valued at \$160, by Thomas Gifford, Esq., for the donors. Several speeches were made, expressing regret that he was about to leave, and all united in wishing him, with his family, prosperity and happiness in their new home.

INFORMATION WANTED.

Will Superintendents or others who may know of the whereabouts of Charles W. Walker, an operator formerly in the employ of the Chicago and Alton Railroad Co., please furnish such information to C. H. Seaver, Supt. Telegraph, Chicago Ill. Mr. Walker is supposed to be somewhere in Pennsylvania.

Journal of the Telegraph.

This Journal is issued on the 1st and 15th of each month. Its circulation is over 8,000. It goes to every State, Territory and Province on the Continent. It has become a necessity, and is always welcomed as a friend. No better medium for advertising exists.

TERMS:

TWO DOLLARS PER ANNUM IN ADVANCE.

Address—

JOURNAL OF THE TELEGRAPH,
Western Union Telegraph Company,
145 Broadway, New York.

NEW YORK, FEBRUARY 16, 1874.

UNIFORMING MESSENGERS.

With regard to inquiries which have been received concerning the uniforming of messengers attached to the service in other offices than New York City, it is proper to state that the matter has not yet been decided upon. That it is desirable so to do, there can be no question, and eventually it will probably be done; but at present, in view of the expense, the uniforming of messengers will be limited to the largest cities, and in them it will be introduced only after the success in New York has been satisfactorily demonstrated.

PROPER RENDITION OF REPORTS.

We are requested by the Treasurer of the Company to again call the attention of managers of offices to the notice concerning the entry and classification of cable business upon the reports sent to him, which appeared in the last issue of the JOURNAL. Proper entry and classification of this business are essential, and, as neglect of these apparently little duties entails considerable trouble and much extra labor in the Treasurer's department, it is hoped that there will be no further cause of complaint in matters of this nature.

THE ORDER IN RELATION TO HALF-RATE MESSAGES.

It should not be forgotten that half-rate business can no longer be taken collect, neither can such business be embraced in the charged accounts which some offices allow customers to contract. Every half-rate message must be prepaid, cash in hand. See Executive Order No. 153.

THE gross receipts of the JOURNAL during 1873 were over one hundred per cent. greater than in 1872; and in 1872 the receipts were larger than in any year preceding. A more solid evidence of appreciation could hardly be manifested.

EXECUTIVE ORDER No. 154, regarding the counting of extra words in messages received from other lines, appears upon page 55.

THE MILK IN THE COCOA-NUT.

Everybody knows that the Boston philanthropist, Mr. Gardiner G. Hubbard, has spent several of his best years in the endeavor to secure cheap telegraphy for the oppressed American people. His mission takes two forms. In this it resembles all similar missions which must have a basis of existing wrongs on which to erect the glittering banner under which shall come relief. So on one hand, like the Postmaster-General, he represents the Western Union Telegraph Company as the foe to progress, the great anaconda that twines itself around American enterprise, crushing it by its exactions, and annually accreting to itself the power of an odious monopoly. On the other hand, he offers a scheme of relief by which, if Government will but confer upon him and his associates exclusive right to do the telegraph work of the country, and give him certain little charities which he names, he will secure to the American people a system so liberal in its provisions as shall at once usher in the dawn of the bright day which shall make all men happy and himself rich.

We cannot in our limited space review all the charming things proposed by Mr. Hubbard in his bill; we therefore limit our present notice to one, which, as it seems somewhat rudimental, and most promising, may serve to show the genuine goodness of Mr. Hubbard's heart. This is in the matter of rates within the first hundred miles, which are now charged, variously, at 25, 30 and 40 cents within radii of 25, 50 and 100 miles, but which he proposes to render uniform at 25 cents. Now, the sweet charity of this proposition will be better appreciated, when it is known that experience has shown that no profit can be predicated on a 25-cent rate as the business is now conducted, and compensations for service are now paid. Still further will Mr. Hubbard's scheme be honored, when it is known that a very considerable part of the telegraph service of the country is one ranging itself within 100-mile areas. It must not be forgotten, however, that, as the radius of transmission approaches the centre, quickness of delivery becomes more essential. To a distant place, an hour or two may make comparatively little difference, but to the local service there is, evidently, the utmost necessity of dispatch.

Just here is where the little joker makes his bow. A lady steps into Mr. Hubbard's office at Newburgh, and telegraphs her husband to meet her in New York. As the clerk receives it from the fair fingers, he remarks: "No hurry about this, I presume?" "No hurry," replies the astonished lady. "Why, yes, of course; don't you see my husband must meet me at the depot, and he must get it immediately?" "Oh!" ejaculates the Hubbard clerk, "all right; we will give it 'priority'—fifty cents, ma'am." "But," rejoins the lady, "I understood the rate now was only 25 cents; why should I pay more?" "Oh, you know, ma'am, we put your message ahead of all others, you know, ma'am, and charge double, you know. But if you will take your chances and let us send as we can, why, then, it is only 25 cents." Of course the 50 cents is paid with a frown and a feel-

ing of indignation. And so in the vast majority of cases would it be found that the real tariff had become 50 cents, and the imaginary one 25, until public indignation broke every Hubbard window, and shut up every Hubbard shop.

Indeed, this "priority rate" is the profit or speculative feature of the bill. Telegraph service is, essentially, urgent and peremptory, even to great distances. The conception of distance, indeed, is fast fading out as telegraph facilities multiply. New York and Chicago are, largely, a single city. The idea of delay is simply obnoxious and offensive. Any "priority rate" must, therefore, become the standard rate. All experience proves this. Now, the following will illustrate the result under the Hubbard bill. Let all read and reflect. This is the milk in the cocoa-nut. Mr. Hubbard, however, will not drink it, or, if he does, the draught, we think cannot be long:

From Washington to

	Present rate..	Hubbard priority..
Baltimore.....	.30	.50
New York.....	.40	\$1.10
Boston.....	.60	1.10
Chicago.....	\$1.00	2.00
Cincinnati.....	.75	1.60
Cleveland.....	.75	1.10
Richmond.....	.40	.70
Charleston.....	1.00	1.60
New Orleans....	1.50	2.50
Nashville.....	1.00	2.00
St. Louis.....	1.25	2.00
Louisville.....	1.00	1.60
Atlanta.....	1.00	1.60
Pittsburgh.....	.50	1.10
Portland, Me....	.75	1.60
Hartford, Conn..	.60	1.10
Lake City, Fla..	1.25	2.00

UNNECESSARY SERVICE MESSAGES.

In the diminished number of service and office messages there has been considerable improvement of late, but the wires are still burthened unnecessarily. A large portion of these messages undoubtedly have their origin from thoughtlessness or lack of judgment. It has been suggested that Managers be required to show cause why they should not be required to pay for messages *apparently* not necessary for the proper transaction of the Company's business. The adoption of this course would probably result in reducing this class of business to a proper limit.

There is another point in the matter of unnecessary labor which should be rectified. It is a common occurrence in offices having all necessary information at command, to waste time and cause unnecessary repetitions by sending messages upon wrong and indirect routes. There can be no excuse for this.

MR. F. A. ABBOTT, a witness for the defense in the case of John J. Kiernan vs. the Manhattan Quotation Company, of this city—which is being heard before Rufus F. Andrews, Referee, being charged with stealing the plaintiff's news—refused to answer the question as to how he obtained news for defendant, and was sent before Judge Lawrence for contempt.

THE FIRE-ALARM SYSTEM.

The fate of the four unfortunate members of the Stiner family, who met death at a recent fire in this city, has served to awaken public interest and inquiry as to the efficiency of the system of fire-alarm telegraph in use in this and the other principal cities in the country. The verdict of the Coroner's jury, at the inquest which was held upon the bodies, while conveying no censure, and indicating no want of faith in the existing system, declared that, in certain of the upper portions of this city, the Fire Department is inadequate to the public needs, and that had it been otherwise these lives might have been saved. If this is true of New York, it is equally true in regard to other places with a similar system, and it becomes of vital importance that a remedy be devised and applied. An article in the New York *Herald* states that—

"The Commissioners have begun to feel that the present system of fire-alarm telegraph, while a very excellent one, is not sufficiently understood by the general public to be of such service as it might be did every person understand its uses and management. They therefore propose that every citizen shall be his own bell-ringer. The Commissioners propose to cause cards to be distributed in every house within proximity to a fire-alarm telegraph box, instructing the inmates how to use the telegraph and where to find the key. It has been observed that in many cases fires would be signalled much more promptly than they are did the people who discover them know precisely what to do. Ignorance in the matter begets danger and great loss of property, and some benefit is hoped from this popular means of instructing people, who, of their own volition, would never learn."

Could this proposition be carried into effect it would go far to prevent loss, both of life and property. But this is not sufficient. It is necessary to strike at the root of the matter. Too much time is and would be lost in giving an alarm.

We believe the solution of the question to be in the hands of the fire insurance companies of the country. Did they insist that an electrical or other fire detector, and a fire-alarm signal box—such an apparatus as that used by the American District Telegraph Company—be placed within every habitation insured, fires of any great magnitude, unless occasioned by explosions or accidents of a similar character, would be next to impossible.

From what we learn of the operations of the American District system, we gather that upon the fire signal being received at their office, a man is at once dispatched with a fire extinguisher to the point of alarm, and in nine out of ten cases the fire is extinguished in its incipiency, long before the public fire department could have arrived at the scene.

We instance this matter to illustrate how electricity can by every one be made to add to the general security and safety. Every dwelling should possess the means of *instantaneously* summoning swift and effectual aid in time of emergency. As an auxiliary to the present system this condition would meet an urgent public need.

The administration of the oath in civil cases is of high antiquity. See Exodus xxii., 11. Swearing on the Gospels was first used in 528. The oath was first administered in England by the Saxons in 600.

THE TELEGRAPH AND THE MAILS.

In the trial of an English election petition the other day the Post-Office authorities were required to produce the telegrams which had passed between certain persons during the election. A clerk accordingly attended with "a sackful" of the desired documents, but refused to give them up without an order of the Court. The Judge took three days for consultation and reflection, and then declined to interfere. "His lordship said he did not intend to go into the reason for this decision, because he had no wish to say that cases might not arise where strong specific grounds might justify the interposition of 'the election judge.'" The demand was not pressed, and the telegrams were not read. The inquiry is now raised why telegrams should not be held as sacred as letters, and protected absolutely against the espionage which they seem to have narrowly escaped on this occasion.

The increasing use of the telegraph as a substitute for the post gives this question considerable importance in this country as well as in England. There is no good reason why the correspondence which is sent by wire should be any less sacred than the correspondence which is sent by rail; but the law on the subject is in a very unsatisfactory state, and nothing but the fear of public odium protects the telegraph office now from legal inquisitions. We have proof that the mails have occasionally been tampered with by Custom-House officers, and a newspaper holding intimate relations with the Administration calmly told us the other day that the Government had under consideration a more complete system of post-office espionage for the protection of the revenue. What would happen if Government officials had the handling of all our telegraphic messages? A letter is sealed, and to read it involves delay, trouble and the risk of detection. But dispatches are open. Copies are taken of them. They are read always by two and generally by three or more persons before they reach their destination. There can hardly be a doubt that while the average character of public officers is as low as it is now, the confidence of the people under a Government telegraph system would be systematically violated. In times of political excitement, opponents of the party in power would be practically debarred from the use of the wires for political purposes, because they could never trust them. Opposition newspapers could not communicate freely with their correspondents, and the press generally would get no intelligence which the authorities saw fit to suppress. And then imagine what the result would be when the Government began to watch the telegraph office "for the better protection of the revenue," and every importer became subject to a perpetual inspection of his private correspondence.

It is one of the rarest of incidents now-a-days for the secrecy of the telegraph office to be violated. There are two reasons for this. In the first place the business in the United States is very well managed—much more efficiently than any Government business could be—and in the second place the companies are liable in damages for any wrong to their customers. But if the post-office loses a letter, or sends it to a wrong address, or detains it, the sufferer has no redress whatever; and there would be none for blunders and dishonesty in postal telegraphy.—*N. Y. Tribune.*

A BILL has been introduced in the New Jersey Legislature, to incorporate South Jersey Telegraph Company with \$5,000 capital, and power to increase to \$30,000, and the right to build lines in Cumberland, Cape May, Salem, and Camden Counties, and on lands under water in such counties.

STUPIDITIES.

Under this head, Dr. Hall, in his *Journal of Health*, humorously discourses on the tendency of the times, as follows:

It is really a great wonder that everybody is not dead and buried, and the world itself used up entirely, if the thousandth part of what is told us about microscopical and other "discoveries," so called, is true. One man will have it that the glorious Union over which the stripes and stars float so proudly will soon become depopulated, because respectable people don't have children; another has discovered myriads of bugs in the chateaux and waterfalls of the ladies, boring into their skulls and sucking out all the remaining brains of the dear delightfuls. A German *savon* now tells us that every sip of tea we take is full of oily globules which get into the lungs direct, weaken them, set up a cough, and the person dies of consumption. Another man has found that the purest spring water, clear as crystal to all appearance, if let alone will deposit a sediment which generates typhoid fever; hence he proposes that everybody shall quit drinking water. Another says that bread has so much lime in it that it is turning us all to bone, and makes us stiff in the joints, that being the reason we have no lithe, sprightly old men now-a-days; hence we are full of limps and rheumatics long before our time, therefore we had better quit eating bread altogether, and live on rice and sago and tapioca. The water-cure folk assure us that pork and beans and ham and eggs are full of abominable *trichinae*, and that, if one is swallowed and gets fairly nestled into the system, he, she or it will breed a million more in a short time, and that roast beef has juvenile tape worms in it. And here come Tom, Dick, and Harry, all in a row, loaded down with microscopes and spy-glasses which show as plain as day that the air is swarming with living monsters and putrid poisons, which fly into the mouth and crawl up the nose and creep into the ear; hence it is death to breathe such pestilential air, and that the best way is to keep the mouth shut, plug up the nose, and ram cotton into the ears.

Ever so many learned professional gentlemen have been torturing poor figures for years to make them tell the stupendous fib that everybody is either crazy or soon will be; that the annual increase is ten per cent., consequently in eleven years everybody will be crazy, and more too.

The fact is that the people who spend their time in hatching out these tomfooleries, ought to be put to work and be made to earn an honest living. This world has been pretty well taken care of for some thousands of years, increasing in comfort and wealth and life, the average length of which last has doubled within two centuries, and the population increased perhaps three-fold; and the presumption is that the Great Maker of all will so arrange all the antagonistic forces of life for the future as eventually to make "the wilderness and solitary place to be glad, and the desert to rejoice and blossom as the rose," and the race be happy still.

THE ENGLISH LANGUAGE.—*Nature*, in reviewing a volume of essays by Alphonse de Candolle, the veteran botanist, mentions one essay as especially interesting. This essay treats of the importance to science of a dominant language; and it contains some very curious facts as to the way in which the English language is spreading on the continent. M. de Candolle believes that in less than two centuries English will be the dominant language, and will be almost exclusively used in scientific works.

ELECTRICAL METALLURGY.

Specifications of the English patents of R. Werderman, C. E., have lately been published, which are interesting as presenting a new application of electricity to the arts. This new purpose, to which electricity lends its aid, is to the reduction of metals from their ores, and the refining and purifying of the reduced metals, without the ordinary chemical action of carbonaceous matter, the purifying and refining taking place at the same time and by the same process, during the reduction from the ore. The ores—that is to say, oxides, sulphides, carbonates, or other combinations in which the metals exist in nature—are first crushed, and then heated in a suitable furnace or retort. After the whole charge is raised to a red heat, two pieces of carbon or platinum, or some other suitable material which conducts electricity, are plunged in the crushed ore. These two pieces are connected by platinum, or other suitable wires or ribbons, with the two poles of a galvanic battery or magneto-electric machine. The electrical action and chemical decomposition which then take place may be seen from the following equations, which are given for the purpose of illustration, and are arranged in the order for their elimination:

		Negative pole.	Positive pole.
Oxide of zinc....	ZnO	Zn	O
Real ox. of copper	Cu ₂ O	2Cu	O
Plumbic oxide....	PbO	Pb	O
Sesquiox. mang'se	Mn ₂ O ₃	2Mn	O + O + O
Loadstone.....	FeOFe ₂ O ₃	5Fe	SO ₂
Hematite.....	Fe ₂ O ₃	2Fe	As ₂ O ₃
Brown hematite..	2Fe ₂ O ₃ ·3H ₂ O	3Fe	Ph ₂ O ₃
Spathic iron.....	FeCO ₃	Fe	SiO ₂
Sulphide of zinc (blende).....	ZnS	Zn	CO ₂
Subsulphide of copper.....	CuS	{ Cu }	CuS
Sulphide of nickel	Ni ₂ S	2Ni	{ SO ₂ }
Bisulphide of iron (pyrites).	FeS ₂	Fe	2SO ₂
Manganous carb'te	MnCO ₃	Mn	CO ₂ + O
Carbon'te of zinc (calamine)....	ZnCO ₃	Zn	CO ₂ + O

The reduction of iron ores may be effected either in the usual manner in the melting furnace with carbonaceous matter, or in a reverberatory furnace with some suitable flux only. The best ore for this purpose is the hematite, because it is a good conductor of electricity. As soon as the oxide begins to flow, the reduction takes place, and all noxious elements are eliminated in the following order, viz.: sulphur, arsenicum, phosphorous, titanium, silicon, carbon.

By regulating in a suitable manner the electromotive force and the intensity of the electric current, and stopping it at the proper moment, cast iron, wrought iron, or steel, can be produced directly from the furnace without any intermediate operations. This puddling by means of an electric current will occupy from 10 to 15 minutes only, instead of several hours, as in the ordinary puddling by hand labor or machinery, and consequently a great saving of time will be effected.

The entire liberation of the electro-negative elements is in some cases not effected immediately, but an intermediate transformation of the ore takes place. For instance, in treating the sulphide of copper, this ore does not conduct electricity at the ordinary temperature, but at 230° Fahrenheit it becomes a very good conductor; copper is then produced at the negative electrode or pole, and at the positive pole sulphide of copper is formed, which, being a good conductor at a low temperature, is now

entirely decomposed and converted into metallic copper. A great difficulty in the reduction of plumbic oxide in the usual process consists in the formation of silicate of lead, due to the presence of silicates mixed with ore. This difficulty is entirely overcome by the application of the electrical current for the formation of the silicate of lead, which is readily fusible and is no obstacle; and all ores rich in silicates, which could not be treated till the present time, can now be employed for the extraction of lead.

Instead of treating the sulphides and carbonates and other more complicated combinations directly by the electrical current, such ores may first be converted into oxides by roasting them in the usual manner for some time in contact with atmospheric air or oxygen.

While the metal is being reduced, all impurities and noxious elements mixed or combined with it are eliminated, so that finally the metal is collected perfectly purified and refined.

In purifying metals, the removal of the metals or metalloids which are to be eliminated is effected either in a melting furnace or in a crucible or converter or puddling furnace. Two pipes of fire clay are dipped in the molten metal. Two hollow cylinders of carbon or platinum or other suitable matter are fixed inside the clay pipes at the end immersed in the molten mass. To the carbon or platinum cylinders are attached two platinum wires or ribbons, which run up inside the clay pipes, and are connected directly or by means of copper wires to the two poles of a galvanic battery or magneto-electric machine. To prevent the development of heat in the battery or magneto-electric machine, the connecting wires pass through a cooling apparatus. Instead of hollow cylinders of carbon or platinum, solid cylinders or sheets, or any other suitably shaped pieces, of carbon or platinum or any other suitable matter can be used; in the latter cases, space must be left between the said pieces and the fire clay envelope to permit the eliminated metals or metalloids to be volatilized and to escape through the clay pipes, and to be collected in a suitable vessel, in which they are converted either into the liquid or solid state, or into salts, in bringing them in this *statu nascendi* in contact with any suitable matter to which they have great affinity.—*Scientific American*.

ACTION OF ELECTRICITY ON FLAMES.—*Memoir by M. V. Neyrenneuf. (Extract by the author).*—There has been demonstrated the existence of an electric wind in placing a flame near an electrified point. The experiment is in reality complex, and depends, *inter alia*, upon the nature of the fluid we employ. A flame may be considered as a very good conductor; produced at the extremity of a glass tube well insulated and placed before a point, it attracts the molecules of air that surround this point, and in this manner the wind results. It is susceptible itself of attraction, and with inverse proportionality to the distance of the point; there should therefore exist a certain distance at which the wind acquires a maximum intensity. It is this which I have to make known. If the flame is produced at the extremity of a metallic jet in communication with one of the armatures of a Holtz machine, whilst the point communicates with the other, the electric wind is generally much more intense, but the effects are complex, and follow the relative arrangement of the point and of the flame. Matters arrange themselves always as if the electricity were really propagated in a direction from positive to negative; also a positive point repels the flame, while it is attracted by a negative point. With a Bunsen flame we do not obtain sensible repulsion

DIFFERENCE OF PHYSIOLOGICAL ACTION OF INDUCED CURRENTS ACCORDING TO THE NATURE OF THE METALLIC WIRE FORMING THE INDUCED BOBBIN.—*M. Onimus.*—The author made exactly similar bobbins of copper, lead, and German silver wire. When the wire of the bobbin is a bad conductor of electricity, the muscular contraction produced is stronger, and the impression on the cutaneous nerves is less vivid than with good conductors, as copper. These effects are more marked the greater the exterior resistance. The current induced in bad conductors has greater tension than that in good, and less quantity. Coils of German silver wire may, in accordance with these facts, be advantageously used in electro-medical apparatus.

MAGNETISM.—*M. Gauguin.*—In a permanent magnet, the curve representing currents of detachment sinks very rapidly from the extremities to the heel, where it coincides with the axis. In an electro-magnet the curve is nearly a straight line in the interval between the two bobbins, parallel with the axis of abscissæ, and high above it. The increase of magnetization from application of the armature, is, in the latter, nearly uniform throughout the length of the bar; in the former it is much greater at the extremities than at the heel. The current of demagnetization, produced on rupture of the inducing current when the electro-magnet is without armature, varies nearly as the intensity of the latter for a given point in the magnet. On the other hand, the current of detachment is about proportional to the square of the inducing current. Hence the relation of the current of detachment to the current of rupture itself varies as the intensity of the inducing current. In a series of experiments cited, the proportion of the two currents of demagnetization was 62·8 with a weak inducing current, but it may be raised to 100. Again, the increase of magnetism in a permanent magnet from application of the armature is independent of the duration of contact. In the case of an electro-magnet, the reaction from application of the armature is effected in a very short time, but it is not instantaneous. The magnetic state was (under the conditions of experiment) appreciably modified during four or five seconds. M. Gauguin further experimented as to the apparently neutral state of magnets pointed out by M. Jamin; first, sending through the bobbins of an electro-magnet, having armature attached, a current of the intensity 17,980 (measured by a conical multiplier); then, after a few seconds circulation of this, a current of contrary direction and intensity, 8,900, for a few seconds. After these operations the iron core does not possess any apparent magnetism, but it has the property of being magnetized more energetically in one direction than the other, when subjected to two equal inducing currents of contrary signs, and of less intensity than 17,980. The magnetization in any case was very slight, but could be measured by the method of currents of detachment. Conformably to M. Jamin's observations, the author found the inequality of the two magnetisms effaced as the current approached the intensity of 17,980. The apparently neutral state can be obtained a great many different ways, the iron having different properties in each case. The author supposes a superposition of alternate layers of contrary magnetism, positive and negative. He experimented by sending through the bobbins of an electro-magnet with armature—1, a current considered positive, of intensity 17,900; 2, a negative current, of intensity 11,100; 3, a positive current 5,898. After this process the iron has no sensible magnetism, but has the following properties: When an inducing current of determinate strength is passed alternately in opposite direc-

tions, the two magnetizations, positive and negative, are generally unequal, and their relation varies with the intensity of the inducing current. When this intensity is little above 5,898, the negative magnetization is considerably above the positive; with intensity 8,606, the two magnetizations are equal; as the intensity continues growing, the positive intensity becomes superior; it is much the greater for intensity 11,100; and, lastly, the two magnetizations become equal again for intensity 17,900. To explain these effects, it must be supposed that the bar contains two layers of positive magnetism, separated by one of negative.

BEHAVIOR OF NON-CONDUCTING SUBSTANCES UNDER THE INFLUENCES OF ELECTRICAL FORCES.—*M. L. Boltzmann.*—The author deduced from Helmholtz's theory of dielectricity that electric forces may exercise considerable attraction on a non-conductor simply through dielectric polarization; that a non-conducting ball in a homogeneous field should be

D—1
— times as strongly attracted as a similar and insulated conducting ball acted on by the same force through induction; D being the constant of dielectricity.

In a first series of experiments values of D were obtained with a condenser, a battery, and an electrometer for hard gum, sulphur, paraffin, and colophony. In a second series the method of experiment was briefly as follows: A ball of the insulating substances was hung by a silk thread at the arm of a delicate balance, whose motions were indicated by a small mirror. Near this movable ball was a fixed one which could be charged from a machine with either positive or negative electricity. For the non-conducting ball an equal sized conducting one could be substituted. A second balance with conducting ball suspended near the fixed ball served as measure of the quantity of electricity. Comparison was now made between the attractions of the non-conducting and the conducting balls on the first balance to the fixed ball. The numbers given in a table show how much more the conducting ball was attracted than the non-conducting one. According to the theory of dielectrics, these numbers

should have the value $D+1$. The values of D deduced from this are compared with those from the former measurement. In some cases there is pretty close agreement; in others difference. It was observed that the longer the electric action the more considerable was the dielectric polarization. M. Boltzmann thinks his method should yield valuable results on the hitherto little studied behavior of insulators in the electric field. The author further views his numbers in connection with Maxwell's hypothesis that light and electricity are different forms of motion in one and the same medium. Between the dielectric constant, D, and the refractive index, n , of any substance, Maxwell obtained the relation $n = \sqrt{D\mu}$, where μ is the coefficient of magnetic induction. This coefficient in the four above-mentioned substances cannot be very different from air, which is taken as —1. So that we have the index of refraction equal to the square root of the constant of dielectricity. M. Boltzmann accordingly compares the square roots of these constants as found by his method with the refractive indices as determined by Wollaston's method; and the differences are not sufficiently great not to be attributable to unavoidable errors of observation. He considers these results, though not so accurate as to lead to the identification of light and electricity, yet furnish strong support to Maxwell's theory.

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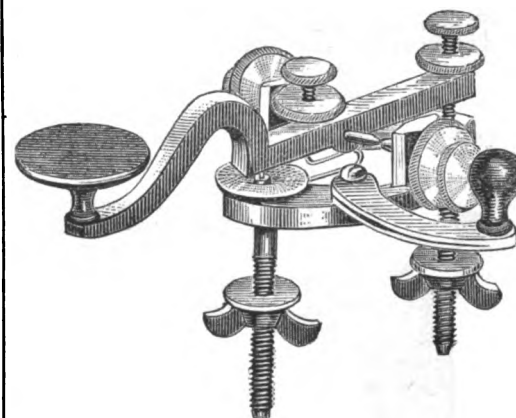
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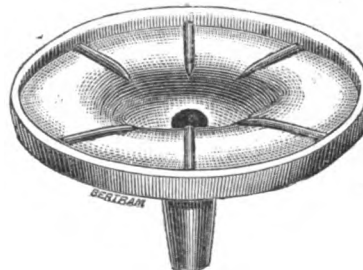
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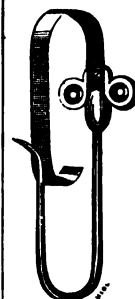
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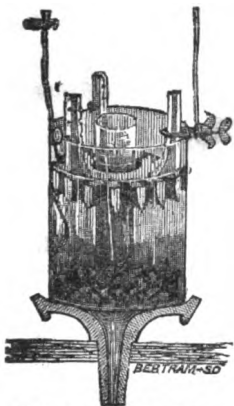
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It has now been in constant use for nine months, and will not need new zinc until after January next.

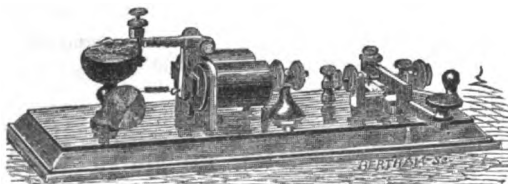
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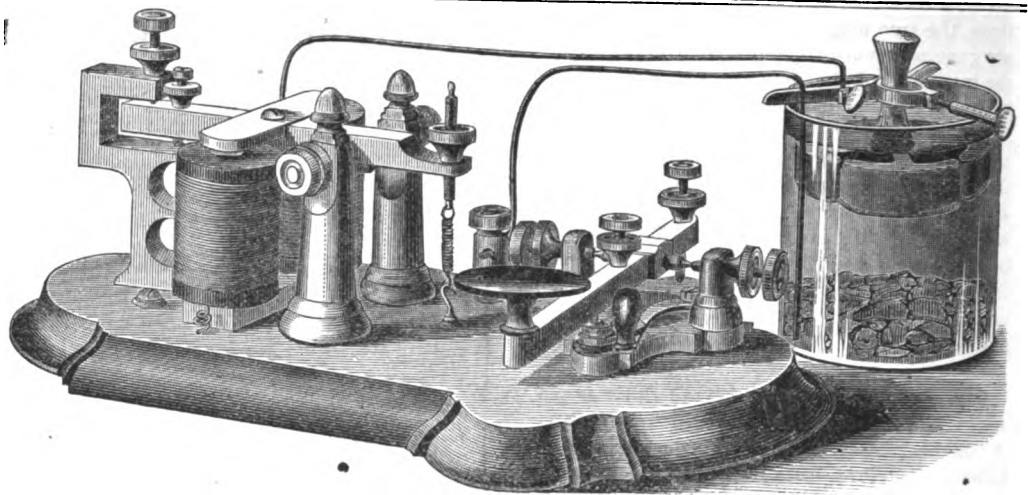
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WHOLE NO. 153.

RESISTANCES AND THEIR MEASUREMENT.

A series of papers upon "Resistances and their Measurement," by Mr. H. R. Kempe, are in course of publication by the *Telegraphic Journal*. The following article is from the issues of January 1st and 15th:

The essential points of a good set of resistance coils are, that they should not vary their resistance appreciably by variation of temperature, and that they should be accurately adjusted to the standard units, and this adjustment ought to be such that not only should each individual coil test according to its marked value, but the total value of all the coils together should be equal to the numerical sum of their marked values. It will be frequently found in imperfectly adjusted coils that although each individual coil may test, as far as can be seen, correct, yet when tested all together, their total value will be 1 or 2 units more or less than their numerical value; because, although an error of a fraction of a unit may not be perceptible in testing each coil individually, yet the accumulated error may be comparatively large.

The wire of the coils is, as a rule, of German silver, the specific resistance of which metal is but little affected by variations of temperature. The wire is insulated usually by a double covering of silk, and is wound double on ebonite bobbins, the object of the double winding being to eliminate the extra current which would be induced in the coils if the wire was wound on single. By double winding, the current flows in two opposite directions on the bobbin, the portion in one direction eliminating the inductive effect of the portion in the other direction. When wound, the bobbins are saturated in hot paraffin wax, which thoroughly preserves their insulation, preventing the silk covering from becoming damp, which might have the effect of short circuiting the coils and thereby reducing their resistance.

The small resistances are made of thick wire, the higher ones of thin wire to economize space.

When bulk and weight is of no consequence, it is better to have all the coils made of thick wire, more especially if high battery power is used in testing, as there is less liability of the coils becoming heated by the passage of the current through them.

A set of resistance coils generally consists of a number of coils of such values that any resistance from 1 to 10,000 can be obtained. One arrangement in general use has coils of the following values:—1, 2, 2, 5, 10, 10, 20, 50, 100, 100, 200, 500, 1000, 1000, 2000, 5000 ohms.

These numbers enable any resistance from 1 to 10,000 to be obtained, using a minimum number of coils without fractional values. With these numbers, however, it is a matter of some little difficulty to see at once what coils it is necessary to put into circuit in order to obtain a particular resistance; and as it is often necessary to be quick in changing the resistances, the following numbers are frequently used:—

1, 2, 3, 4, 10, 20, 30, 40, 100, 200, 300, 400, 1000, 2000, 3000, 4000.

With these numbers any particular resistance that is required to be inserted can be seen almost at a glance.

The way in which the different coils are put in

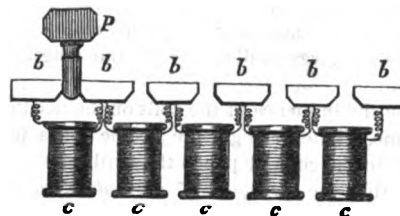


Fig. 1.

is shown in Fig. 1. The ends of the several resistances, *c, c, c,* are inserted between the brass blocks, *b, b, b,*. Any of the coils can then be cut out of the circuit between the first and last blocks by inserting plugs, *p*, between the blocks as shown, which short circuits the coils between them; thus, if all the plugs were inserted there would be no resistance in circuit, and when all the plugs were out all the coils would be in circuit.

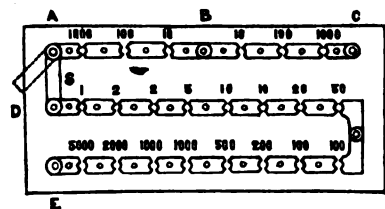


Fig. 2.

There are various ways of arranging the coils in sets; one of the most common is that shown in Fig. 2. This form is much used in submarine cable testing. The brass blocks, here shown in plan, are screwed down to a plate of ebonite which forms the top of the box in which the coils are inclosed. The ebonite bobbins are fixed to the lower surface of the ebonite top, the ends of the wires being fixed to the

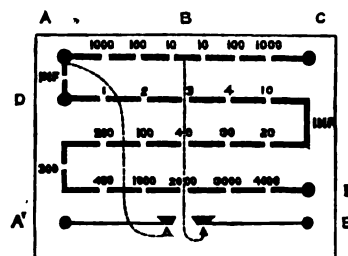


Fig. 3.

screws which secure the brass blocks. The holes shown in the middle of the brass blocks are convenient for holding the plugs that are not in use. It will be seen that six binding-screws, *A, B, C, D, E, F*, are provided; when we only require to put a resistance in circuit, the two screws *D* and *E* would be

used. The use of the other screws and of the movable brass strap, *s*, will be explained hereafter.

In using a set of resistance coils, one or two precautions are necessary. First of all, it is necessary to see that the brass shanks of the plugs are clean and bright, as otherwise the insertion of a dirty plug will not entirely cut out of circuit the coil it is intended to; it is a good plan, before commencing to test, to give the plug a scrape with a piece of glass or emery paper, taking care to rub off any grains of grit which may remain sticking to it after this has been done.

When a plug is inserted, it should not be simply pushed into the hole, but a twisting motion should be given it in doing so, so that good contact may be insured. Too much force should not be used, as the ebonite tops may be thereby twisted off in extracting the plugs. Care also should be taken that the neighboring plugs are not loosened by the fingers catching them during the operation of shifting a plug.

Before commencing work, it is as well to give all the plugs a twist in the holes, so as to see that none of them are loose. On no account must the plugs be greased to prevent their sticking, and their brass shanks should be touched as little as possible with the fingers.

For taking the insulation resistance of a line in the manner described in the last article, such an elaborate set of coils is not, of course, required. A single coil of a resistance of 1,000 ohms in a box with two binding-screws, to which the ends of the coil are attached, is all that is required.

One of the most useful set of coils for general purposes is that shown in outline in Fig. 3. The general arrangement of resistances, it will be seen, is the same as in Fig. 2. Two keys, however, are provided (shown in the figure in elevation for distinctness), the contact point of the left hand key being connected, as shown by the dotted line, with the middle brass block of the upper set of resistances, the binding-screw *B'* at the end of the key corresponding, in fact, when the key is pressed down, with the binding-screw *B* shown in Fig. 2. In like manner, the binding-screw *A'* corresponds with the binding-screw *A*. In the place of the movable piece of brass between *A* and *D*, a plug marked *INF.* (infinity) is provided, which answers the same purpose. An infinity plug is also placed at the second bend of the coils at the left hand of the figure.

When we require simply to insert a resistance in a circuit, we should use the binding-screws *A'* and *E*, the left-hand key being pressed down when the deflection of the galvanometer needle is to be noted. The current can thus be conveniently cut off or put on when required by releasing or depressing the key. Care should be taken that the two *infinity* plugs are firmly in their places, to insure their making good contact. The key contacts should be occasionally touched with emery paper or a fine file, to insure their contact being good.

For the class of measurements in which it is either required, by adjusting certain resistances, to bring the needle of the galvanometer used to zero, or to the same deflection in making two measurements, a galvanometer having its scale graduated to degrees would be sufficient. It should be provided with an astatic pair of needles suspended by a cocoon fibre whose end is attached to a screw, by the twisting of which the needles can be lowered down on to the coils, so that when not in use there would be no danger of the fibre being fractured by rough usage in moving the instrument about.

When the instrument is to be used, it should be placed on a firm table, and the screw attached to the fibre turned until the needles swing clear of the coils. The instrument should then be placed in such a position that the top needle stands as nearly as possible over the zero points. It should then be carefully leveled by means of the leveling screws attached to its base until the metal axis which connects the two needles together is exactly in the centre of the hole in the scale card through which it passes.

This adjustment of the needles to zero is much facilitated in some galvanometers by making the coils movable about the centre of the scale card by means of a rack and pinion, or even by a simple handle attached direct to the coils. The final adjustment can thus be made without shaking the needles, which would render exact adjustment difficult.

In the best galvanometers there is a scale graduated to degrees attached to the coils, so that the angle through which they are turned can be seen if required. This scale is employed when using the instrument as a *sine* galvanometer.

We before stated that the strengths of currents producing certain deflections are not directly proportional to those deflections, but to some function of them, such as the *tangent*. In measuring strengths of current by the *sine* galvanometer we proceed as follows:

The needle is first adjusted to zero. The current whose strength is to be measured is then put on, and a deflection of the needle produced. The coils are then turned round; this causes the needle to diverge still more with respect to the stand of the instrument, but the angle which it makes with the coils becomes less and less the further it is turned, and finally a point is reached at which the needle is again parallel to the coils—that is, its ends are again over the zero points on the scale card. The reason of this is, that the deflective action of the coil on the needle is always the same, provided the current strength does not vary, but the further the needle moves from the magnetic meridian, the greater becomes its tendency to return to that meridian, and when finally the needle becomes parallel to the coils the deflecting force of the coils exactly balances the reactive force of the earth's magnetism.

The strength of the current which produces the deflection of the needle will then be directly proportional to the *sine* of the angle through which the coils are turned.

The galvanometer used as a *sine* instrument is extremely accurate if properly used, its results being entirely independent of the shape of the coils, size of the needle, &c. The only precaution necessary is to see that when the needle is at zero at starting it is brought back exactly to zero; for, indeed, it is not absolutely necessary that the starting point be zero,—the law of the *sines* holds good if the needle be at, say, 5° when commencing, but in this case the needle must be brought back by the turning of the coils to 5°, and not to zero.

The *tangent* galvanometer, which is, perhaps, the most useful and convenient form of galvanometer for general purposes, consists essentially of coils of wire wound in a deep groove in the circumference of a circular ring, usually of brass, about six or seven inches in diameter, with a small magnetic needle at its centre moving over a graduated circle. To render the instrument correct, it is necessary that the length of the needle be small compared with the diameter of the ring of wire; about three-quarters of an inch for a six or seven inch ring is a convenient size.

The object of having the needle small, as compared with the diameter of the coils, is to insure, as far as possible, the magnetic influence of the coils on the needle being the same at whatever angle the needle may be with respect to the coils. Theoretically to effect this result, the magnet should be a mere point, but this is, of course, impossible, and the error is not great when the coil is eight or ten times as large in diameter as the length of the needle.

Upon the influence of the coils on the needle being the same, whatever angle the needle takes up with respect to the coils, depends the truth of the proposition, that the *strengths of currents circulating in the ring are proportional to the tangents of the angles of deviation of the needle*. As it would be difficult to read off the angular deflection of the needle from the needle itself, on account of its shortness, the long pointer is attached, which moves over the graduated scales under its extremities.

One of these scales is graduated to true degrees, and the other to numbers proportional to the tangents of those degrees, so that if we read off two deflections from the degrees scale, the other extremity of the pointer will indicate numbers proportional to the tangents of those two degrees of deflection.

Now as the strengths of current producing certain deflections are proportional to the tangents of the degrees of deflection, if we read off from the degrees scale we must, before working out a formula which has reference to the strengths of currents, reduce the degrees to tangents from a table of tangents. If, however, we read off from the tangent scale, no reduction is necessary, and the numbers can be at once inserted in the formula.

To avoid parallax error in reading off from the scale, in consequence of the needle being elevated above the scale, a piece of looking-glass is provided close to the tangent scale, so that when we look at the end of the needle and see that the reflected image of the pointer coincides with the pointer itself, we know that we are looking at the end of the pointer perpendicularly with the scale.

The instrument being generally provided only with a looking-glass near the tangent scale, it is necessary when reading off from the degrees scale to run the eye along the pointer to the looking-glass end, and see whether the reflected image corresponds with the pointer at that end; if it does, we may be sure that, when we look at the degrees scale, we do so correctly.

The instrument is provided with five terminals, A, B, C, D and E.

The two terminals D and E are attached to the ends of a thick wire, making two or three turns only round the ring; to the terminals A and B are attached the ends of a finer wire, about No. 24 or 30 B.W.G., making a larger number of turns, and having altogether a resistance of about 20 ohms. A similar wire is also attached to the terminals B and C, so that if we use the terminals A and B, or B and C, we have 20 ohms in circuit; and, if the terminals A and C, a resistance of 40 ohms in circuit. The object of

having three different coils is to enable us to work with strong or weak currents; thus, when working with a strong current, we should use the terminals D and E, as there being only a few turns of wire the effect on the needle would not be strong. With a weaker current we should use the terminals A and B, or B and C, and with a still weaker one the terminals A and C. The proper terminals to use in making any particular measurement is best found by experiment; the different terminals being tried until a convenient deflection is obtained. If it is found that one set of terminals gives too high and another too low a deflection, the battery power used must be varied, or resistance inserted in the circuit. Experience only can determine what it is best to do in different experiments, as no satisfactory rule can be laid down.

Before using the galvanometer it should be seen that the pointer has not become bent, but stands at right angles to the magnet, and that when suspended it turns freely. On no account should the magnet suspension be oiled to make it turn more freely, as quite the opposite effect to what is intended will be produced by so doing. Care should be taken that the scale is in its proper position, so that when the two ends of the pointer are over zero points, it (the pointer) stands at right angles to the coils.

ANNUAL REPORT OF THE BELGIAN TELEGRAPHS FOR THE YEAR ENDING DECEMBER 31, 1872.

GENERAL SITUATION.

The condition of the telegraphic system and its extensions, in 1872, are shown in the following table:

	1st Jan., 1872.	1st Jan., 1873.	Extension in 1872.
Length of lines, in miles.	2,752	2,859	107
Length of wires, "	9,819	10,971	1,152
Number of offices.....	478	523	44
Number of instruments..	835	910	75

These lines and wires were divided on the last of December, 1872, viz:

	Lines.	Wires.
On the State railways....	986 miles.	6,855 miles.
On chartered railways....	1,049 "	2,916 "
On ordinary routes.....	819 "	1,118 "
Underground wires in the cities.....	5 "	82 "
	2,859	10,971

Besides these, there were 815 miles of wire operated by chartered railway companies at their own expense.

These wires, as well as the instruments worked on them, are nearly all employed for private correspondence as auxiliary means of communication.

The entire telegraphic system in Belgium thus comprised on the 1st January, 1873, 11,786 miles of wires.

The 523 offices in operation on the 31st of December, 1872, are divided as follows:

A.—Government Offices.	
In the Government Railway Offices.....	209
In the Chartered Railway Offices.....	90
In the Centres of Cities and Towns.....	106
Total number of Government Offices....	405
B.—Offices of Chartered Railroads at which private messages are received for transmission.....	
	117
Total	523

The whole number of Government instruments in the 31st of December, 1872, was divided as follows :

	<i>In use.</i>	<i>In reserve.</i>	<i>Total.</i>
Horse Apparatus.....	874	22	896
Jughes Apparatus.....	14	9	23
Dial (Lippen's) Apparatus...	10	3	13
Dial (Breguet) Apparatus....	12	2	14
	910	36	946

II.—EXPENSES AND RECEIPTS.

The amount allowed for the construction and extension of Government telegraph lines to the 31st December, 1872, was \$591,090.

The expenditures to this date amounted to \$590,277; balance \$163.

These expenditures were made as follows, viz :

Telegraph lines	\$378,127 00
Instruments, batteries and office furniture.....	173,888 00
Value of supplies on hand.....	33,912 00
	\$590,927 00

Divided over 10,971 miles of wire, and deducting the supplies, makes the average cost \$53.86 per mile, including cost of apparatus and office furniture.

The expenditures of the telegraph service in 1872 were as follows :

Salaries of officials and employes....	\$310,323 06
Wages of laborers and messengers...	102,799 84
Repairs of lines and material.....	41,869 76

Total.....\$354,892 68

This amount does not include the telegraphic service share in the general administration expenses, such as printing, light, heat, &c. But the free transmission of messages for the benefit of other branches of the administration, and the cost of material furnished for the benefit of railroads in certain offices, where there is no private correspondence, more than compensates therefor.

The receipts of the year were as follows, viz :

Interior Service.....	\$164,815 17
International.....	135,491 48
Transit	36,607 32

Total.....\$336,913 97

Excess of expenses over receipts.. \$17,978 71

It will be noticed that the expenses of the telegraphic service increase gradually, owing to reasons quite independent of the number of private messages transmitted. The increase in the expenses is due to the increased compensations paid to the newly appointed *personnel*, the increased wants of railroads, and the increase in the number of offices. The improvements of the system constantly necessitate expenditures, which remain unproductive for the most part, as they are not compensated by the increase of business.

The considerable and rapid development of the railway service has necessarily increased the number of free communications.

This may be seen from the following total amounts, which give the annual numbers of official messages since 1869 :

1869.....	815,722 Messages.
1870.....	405,353 "
1871.....	655,416 "
1872.....	790,711 "

The very numerous telegrams sent by the managers of chartered railroads by virtue of conventions, which guarantee to the public correspondence the cooperation of the lines and the employes of the companies, are not included in the preceding totals.

A very careful superintendence is exerted by the central direction to prevent any unnecessary use of the telegraph ; and hence it must be admitted that the utility of the 790,711 official messages sent in 1872, is at least equal to that of the same number of private messages. But this free service necessarily causes considerable expense for employes, wires and instruments.

On the other hand, the movement of private correspondence has remained stationary, and the proceeds have decreased. After the remarkable increase of this traffic in 1870 and 1871, we must naturally expect a diminution of the ordinary progression.

This diminution has been made manifest mainly in the international and transit relations, the only ones where the rates pay. Moreover, a part of the transit business has been the object of an inevitable reduction of rates, which has been in application for the half of the service.

There is no remedy for these unfavorable influences but through an increase of the rates. But it is to be hoped that by confining the unproductive expenses within the strictest bounds, the telegraph after some years will be able, by the increase of private business, to become self-supporting, notwithstanding the manifold services which have been imposed on it.

Although fully admitting that the expenses should not exceed the receipts, it is proper to remark that the capital invested in the Government Telegraph lines is entirely covered by the profits of conducting the business in former years.

In fact, since the organization of the first telegraph lines, up to the 1st of January, 1873, the receipts amounted to.....\$3,129,591 48
And the expenses to.....2,509,208 65

Leaving a balance of.....620,382 83

Which latter amount not only pays for the capital employed up to this date.....\$590,927 13

But leaves, besides, an excess of....\$39,455 70

III.—STATISTICS.

A.—Interior Correspondence.

Progress of the last 9 years:

<i>Year.</i>	<i>Number of Telegrams.</i>	<i>Receipts.</i>
1864.....	252,301	\$54,692 42
1865.....	332,721	65,604 90
1866.....	692,536	77,431 08
1867.....	817,652	89,252 42
1868.....	972,038	104,360 01
1869.....	1,108,737	113,760 54
1870.....	1,343,118	141,481 79
1871.....	1,560,873	162,750 77
1872.....	1,589,344	164,815 12

Compared with 1871, the year 1872 shows an increase of 28,671 messages, or 2 per cent., and \$2,064.40, or 1¼ per cent.

B.—International Correspondence.

Business and receipts (share due to the Belgian system) of the messages exchanged between the Belgian and foreign offices :

	1871.	1872.	Decrease.
Number of Messages.....	662,818	660,523	2,295
Receipts for the Belgian System..	\$144,753	\$135,492	\$9,260

C.—Transit Messages.

	1871.	1872.	Increase.
Number of Messages.....	156,775	157,496	721
Receipts for the Belgian System..	\$43,657	\$36,607	\$7,050

The business has kept up, but the receipts have decreased in consequence of the reduction in the Belgian share from 1¼ franc to 1 franc upon the cor-

respondence with Great Britain, the German Empire, the Scandinavian States, Russia and beyond. This reduction commenced July 1, 1872. It was indispensable in order to make the tariff *via* Belgium the same as by other routes.

D.—Recapitulation.

The following table shows the progress of the business and receipts, as well as the successive reduction of rates since the organization of the telegraphic service :

<i>Years.</i>	<i>Number of Messages.</i>	<i>Receipts.</i>	<i>Average Proceeds each Message.</i>
1851.....	14,025	\$16,848	\$1.20
1852.....	27,217	31,533	1.16
1853.....	52,050	50,452	0.97
1854.....	60,415	53,360	0.88
1855.....	61,443	50,528	0.82
1856.....	99,273	68,320	0.69
1857.....	119,050	77,332	0.65
1858.....	145,726	78,646	0.54
1859.....	196,240	96,141	0.49
1860.....	225,819	100,271	0.44
1861.....	268,968	111,821	0.42
1862.....	291,787	114,958	0.39
1863.....	416,113	116,849	0.28
1864.....	546,497	149,986	0.27
1865.....	674,037	164,472	0.24
1866.....	1,128,005	182,820	0.16
1867.....	1,288,719	203,579	0.15 ^a
1868.....	1,502,599	227,450	0.15
1869.....	1,722,586	251,376	0.14 ^a
1870.....	1,998,412	295,272	0.15
1871.....	2,380,266	351,159	0.14 ^a
1872.....	2,407,363	386,914	0.14
	15,626,610	\$3,129,591	0.20

Sundry Information.

Classification of messages with regard to the number of words :

	<i>Interior.</i>	<i>International.</i>
1 to 20 words.....	94.11	85.92
21 " 30 "	2.86	9.52
31 " 40 "	2.55	3.18
41 " 50 "	0.23	0.68
Over 50 "	0.25	0.75
	100.00	100.00

Classifications of messages in categories :

Single messages	percentage	88.45
Compound "		9.62
Urgent "		1.93
		100.00

Classification of messages with regard to their contents :

	<i>Internal.</i>	<i>International.</i>
State messages.....	0.26	0.58
Stock "	4.66	10.52
Commercial "	38.47	53.78
News report "	1.26	1.81
Private "	55.35	33.31
	100.00	100.00

Average length of messages:

Number of words.....19.46 19.95

Errors in transmitting from copy:

Number of errors in 1,000 words sent or received.....3.79

Official messages:

Number sent.....790,711

Nature of the communications :

Railroad Service.	Movement of trains.....	51.38	
	Mis-sent goods.....	26.06	90.68
	Sundry affairs.....	13.24	
	Telegraph Service.....		6.78
	Postal Service.....		2.54
			100.00

CORRESPONDENCE.

SALISBURY, Mo., February 24, 1874.

To the Editor of the Journal of the Telegraph:

Would it not be well, in publishing semi-monthly circular from Tariff Bureau under head of "General Information," to add the square number to changes of closed, re-opened, P. O. A., &c.?

Being short of space, we have interlined to economize, and for some States have five pages written as above; hence it is a difficult matter to find the office to make notation, and being human we are liable to error. In this we find changes noted for which we have no office of record; hence we have to examine our files closely to find it, if found at all, whereas, if we had the square No., could make the necessary entry at once. The noting of changes, &c., being rather monotonous for offices doing small amount of business, we think changes should be arranged as convenient as possible. The leaves spoken of by Mr. McNeil, we think, should be furnished Superintendents for distribution. AMMERMAN BROS.

WEST NEWTON, PA., Feb. 27, 1874.

To the Editor of the Journal of the Telegraph:

I have been prompted for some time to offer a suggestion relative to the improvement of our "Local Tariff." The instructions given in JOURNAL of June 27th, 1873, in reference to "Local Rates," are entirely ignored by some offices, probably from two causes—namely, through indolence or want of interest on the part of managers, or by those who receive a commission for their services.

One uses the square rate because it is the most convenient; the other uses the same rate for the reason that it increases his commissions.

Our instructions in reference to rates are very plain, "that where two rates are given we are authorized to use the lowest." I would suggest that the present system of "Local Rates" be done away with, and a new tariff adopted instead, which should give the exact "Local Rate," so there could be no misconception as to what the rate should be. If some change could be made to improve the present "Local Rate" system, I am confident it would do away with many of the error sheets now sent out, and effect a saving of thousands of dollars to the company annually, in clerk hire, postage stamps, &c.

J. RIAL.

HIGHSPIRE, DAUPHIN CO., PA., March 6, 1874.

To the Editor of the Journal of the Telegraph:

I notice in JOURNAL of March 2 that the gentleman from Vermont responds to my communication in JOURNAL of February 16, in regard to which is correct in answer to "Will you come?" I understand him to suppose a third person present with him, and that he is making his reply to that third person and not to me. In that case I will agree he is correct in answering "I will go," but to me he must answer "I will come." Now, for example, if I should send a message to Vermont, "Will you come and see me?" how could he answer me "Yes, I will go." If another person be in the room with him then it would be proper to say to such person "I will go," but to me he must answer "I will come." Another instance: If I were to ask Vermont "Will you come to Philadelphia?" I being in Highspire, then he could answer, "Yes, I will go," but my question would not be in proper shape. I should ask him "Will he go to Philadelphia?" Now in regard to the quotation "the gentleman comes over," I think it fits this case just about as well as a round pin would fit a square hole. I hope this will throw some light on the subject, at least when the third party is kept in the dark.

M. J. STONER.

To the Editor of the Journal of the Telegraph:

I notice in the JOURNAL of Feb. 16 an inquiry regarding an attachment to relay to know by sight if line is being used. I think if a relay is placed due east and west and a common pocket compass is placed on the magnet, the operator can tell at a glance if the line is working, and at the same time can see if it is in use by another operator. When there is no current the needle will stand north and south, but when there is the least current it will be drawn toward the pole of the magnet, and if the line is in use will not settle at any point. S.

To the Editor of the Journal of the Telegraph:

As suggestions are in order, I would remark that if our Register Book had "total" columns under the headings, "other offices check" and "this office checks," for extending the additions for each office, it would be very convenient for obtaining the day's total with each office and closing the day's business, and would be more economical in allowing every line of the Register to be used in making entries, without leaving blank lines for additions.

I would also suggest that a special press report rate be gotten up and given a place in the coming tariff book, covering our whole territory. It would be greatly appreciated. S.

To the Editor of the Journal of the Telegraph:

The following case comes up many times every day in this office:

Messages are abbreviated by the receiving operators. They are through messages. I am to send some of them. I send them as written. The operator who takes from me objects to taking them thus—compels me to write in full, or utterly refuses them. To avoid delay I deviate from the copy; that is, if the operator who received is not in the office. If he is in the office, I go to him and say, "—refuses this thus abbreviated." He writes out the words. I go and finish sending.

Has the operator who takes from me any right to object to taking the message as I send it? Have I any right to deviate from the copy except as a means of avoiding delay?

Is it not the inflexible, unvarying duty of every operator to copy down exactly what is sent him, no more and no less?

Is it within the province of any repeating office to question business passing through it further than to see that it bears a correct check as to the number of words?

Are there any circumstances which will justify a repeating office in exercising the functions of the manager of the office for which a message is destined; or from which it originated, or both?

Since every office has a manager, even though the operator and manager are one individual, and since every manager has a superintendent, is it not sufficient recourse for the manager of the office of destination to lay the case before his superintendent? Is there any other way to find out either who broke the rule or to secure conformity thereto?

Finally, is it not sufficient for any receiving operator to know that he has copied what has been sent him exactly as it was sent him; and is he not standing on perfectly safe ground in so doing?

If he is both manager and operator, is it not his duty to receive the message without question the same as if he were an operator in a repeating office; and is it not alone in his function as manager that he writes out in full the copy which is to be delivered, or makes any other change he deems best?

Is it not the design of the Company to be able to say to the addressee of a message, "This is an exact

copy of the original; the possibility of error is admitted; and we will have it repeated if you are quite sure it is not correct; but we have certainly not abbreviated or changed it in any manner."

As business is now done the Company is not able to say this, for operators abbreviate and change at pleasure. X. Y. Z.

To the Editor of the Journal of the Telegraph:

Referring to the communication signed "No. 7, Newburgh Wire," in a late issue, I would ask your decision for his and all such employes' information, of the following question: Would it not have been the proper thing to have told New York Operator that "84" was a signal and not counted in the check; to take the message to his chief if he did not understand it? This would probably have saved much talk over the wire, and prevented the office message, which was a violation of the late order on this subject.

It is a sad fact that the practical operators in large offices (as a class) are very ignorant of the Rules and Regulations, and much valuable time is taken up by managers of small offices who think they can "post" them up in matters of this kind over the wire.

I think it better to refer them to their chiefs for instruction. I hope the day will soon come when the qualifications of an operator must include a reasonable understanding of the manner in which the business is carried on. C. N. H.

CINCINNATI, March 1, 1874.

To the Editor of the Journal of the Telegraph:

A case of what I call the extreme thoughtlessness of an operator came under my observation this morning, and thinking it might be of some benefit to others, I submit it for publication.

On a Sunday morning I received a red message (dated Saturday), which read as follows: "Mrs. — left us at one twenty this morning." Signed by a member of the family—probably the husband of the lady who had just died.

The red message would in all probability hang on office files until 8 o'clock on the next Monday morning, and the party to whom the message was addressed would of course (according to the date) think the death had occurred on Saturday morning, one twenty, the information reaching them by telegraph 60 hours afterward.

One having just lost a friend goes into a telegraph office (not thinking of red and black blanks), writes a message, and the operator counts the words, collects charges, taking for granted that because the message is written on a red blank the sender wants it sent at half rate. I should think that the operator in charge would certainly take such an interest in cases of this kind as to notify customers of the difference in red and black business, and to secure the earliest possible delivery of death messages. Just a few words, by way of information, might often prevent very grave mistakes. AN OPERATOR.

[The suggestions of our correspondent are excellent. Such a courtesy to the customer would be eminently proper, and would, without doubt, be thankfully received.—ED.]

NEWPORT, Me., Feb. 27, 1874.

To the Editor of the Journal of the Telegraph:

Please state in the JOURNAL the number of words in the following:

To "Blackstone Nat. Bank, Boston.

"Send four thousand dollars by express at once.

"(Signed) "H. F. THOMPSON.

"Attest—Wood, operator."

Answer.—There are eleven words.

NORFOLK, Va., Feb. 27, 1874.

To the Editor of the Journal of the Telegraph:

Would it not be just and proper to require persons who send collect messages, that are returned as uncollectible, to pay telegraph tolls on the office message giving notification of non-collection. Persons offering messages of that kind, if informed of the expense to them in case of non-payment at destination, might prepay tolls, when otherwise they would not.

H.

Answer.—Such a course, it seems to us, would be just and proper. There is no order or rule as yet, however, touching the subject.

To the Editor of the Journal of the Telegraph:

In figuring the distance between places for the 25 mile rate, which is correct—the distance covered by wire or by air line? Please answer through your columns.

"PEG-LEG."

Answer.—The air line distance.

SOUTHERIDGE, Mass., Feb. 28, 1874.

To the Editor of the Journal of the Telegraph:

If a message is sent merely saying "report charges for delivery, paid here," has the receiving operator a right to deliver, whatever the cost may be, by special messenger, without first notifying the sending office the amount, when it is an extraordinary one, say ten dollars? Would the sending operator be wholly at fault?

C.

Answer.—The operator receiving such a message would be right in delivering it under the instructions given. But no greater sum should be charged for the service than the actual expense incurred.

FEBRUARY 23, 1874.

To the Editor of the Journal of the Telegraph:

Party sends message 4 P. M., with urgent request for answer, which he prepays. None received at 10 o'clock following morning, I send an office message, which brings the wished for answer. Office message finds its way back to me (with several references) as improper office message. Was receiving office at fault for not complying with Rule 54? Was I at fault under the circumstances for sending the office message? Please answer through the JOURNAL.

D.

Answer.—While it is desirable to afford every accommodation to a customer, it should be understood that the Company does not and cannot agree to procure answers to messages. The obligation of the Company ceases when a message is delivered. If the party addressed fails to return a reply why should the Company send a free message requesting him to attend to his own business or that of his correspondent? Such extra service should be charged for.

To the Editor of the Journal of the Telegraph:

Suppose a message is received from A., addressed to B., and afterwards, previous to delivery, A. sends message to operator instructing him to destroy B.'s message. To follow his instructions does it not leave room for fraud? and therefore is it right to obey his instructions, or should it be delivered with the explanation?

ROCKPORT, TEXAS.

Answer.—The message should be delivered without comment, in the absence of proper authority to detain or destroy it. Such authority in a case of this nature can be derived from your Superintendent, and the order as received should be preserved for reference.

A. R. C.—We cannot inform you as to the probable cost of an electric motor of sufficient power to run a hand-car, or a car of about the same size.

G. Q.—Messages from points upon the Western Union lines destined for the Atlantic cables are to be transmitted in the Morse characters, as used in America. The alphabetical examples given in the printed rules of the Cable Company are for their own service only.

G. S. Buck.—Numerous self-closing keys have been invented, and it is probable that some of them are in use.

O. B. S.—We know of no expedition formed or forming to travel or settle in foreign countries. The agent at St. Louis of the Telegraphers' Mutual Benefit Association, Mr. W. W. Cummings, is the proper party through whom you should apply for admission.

South America.—We cannot advise you in what manner to proceed in order to obtain a position as operator in South America. Brazil, New Grenada, Peru and Chili, all countries in South America, have telegraphic systems. Probably a letter addressed to the Director-General of Telegraphs, in either of these countries, would bring forth the information you desire. A knowledge of the Spanish language would be essential in the three countries last named, and of Portuguese in Brazil.

E. M. H.—Mr. F. W. Jones, Western Union Telegraph Office, Chicago, is agent for the Telegraphers' Benefit Association. Apply through him.

Mc.—Your inquiries are too indefinite.

ELECTRICAL MARINE SIGNALS.

Mr. George Mackenzie, the New York agent of the General Transatlantic Steamship Company, has had under consideration for some months past plans for using electrical lights upon the steamers of the line. On the night of Thursday, March 5th, a party of gentlemen, including the officers of the St. Laurent, left the company's dock, pier 58 North River, on the Virginia Seymour, and proceeded down the bay to witness the experiments with the new lights. Another steamer had been previously dispatched with a light, under instructions to respond to the signals of the Seymour. The boats were about six miles apart, but the signals, when displayed, could be plainly discerned, and appeared to be but a short way off. The lights with which the experiments were made are to be used hereafter on the steamers of the General Transatlantic line, so as to lessen the risks taken by travelers between the continents, and engender a certain degree of assurance of safety.

A COMPANY has been registered in London for the purpose of taking over the manufacture of all Sir Charles Wheatstone's inventions in electro-magnetic telegraphs, electro-magnetic clocks, mechanical clocks, with all the improvements connected with the patents. The company also take over the good-will and stock in trade, and will apply the capital to be raised generally in "assisting and promoting the economic application and development of electrical power." The capital consists of the small sum of £30,000, the whole of which has been already privately subscribed. The subscribers to the capital signing the articles of association are: Sir Charles Wheatstone, R. Sabine, Esq., H. Kimber, F. Braby, Sir S. Canning, T. H. Puleston, and W. Abbott.

TREMENDOUS COST OF IGNORANCE.

President A. D. White, in an address at Ann Arbor, Mich., says: "The material progress of our nation demands that the State make provisions for the higher education. See on every hand the millions of dollars squandered by unscientific engineers. I have seen the traffic of a whole city stopped for days together because nobody could be found able to construct a screw-arch bridge.

"Some years ago I had occasion to visit on public business one of the West India islands. The national ship which carried us out had been newly furnished with engines and machinery at an expense of nearly \$1,000,000, and yet we were so long making five days' voyage that on landing we found our honored obituaries in most of the newspapers. On our return the engines and machinery were condemned as faulty in construction, and were sold for \$50,000—a loss on that single transaction sufficient to rear a better equipped school for the education of civil engineers than the world has ever seen.

"A few years ago some speculators professed to have discovered a valuable gold mine in California, and commenced selling stock at an assumed value of \$1,000,000. Mr. Clarence King, an expert mineralogist, by easy but sure tests, found there was no gold there save what had been purposely put there, and the rich harvest of the swindlers was at an end. How many millions of dollars he has saved to innocent parties by his expose of the Nevada diamond hoax is impossible to compute.

"An eastern capitalist was on the point of investing in an iron mine in Northern Europe. A sample of the ore fell into the hands of a professor in the scientific school at Yale, who applied the proper chemical tests and found so large a proportion of titanium in it as to render the ore practically worthless. The professor's bill was \$200; amount he saved the capitalist \$600,000.

"Scarcely a month passes without a frightful catalogue of losses of life and property through insufficient knowledge on the part of civil and mining engineers."

CHEMICAL DYNAMICS; INTERVENTION OF WATER IN CHEMICAL COMBINATIONS; ELECTRODES OF WATER AND OTHER LIQUIDS, AND THEIR PROPERTIES.—*M. Becquerel.*—(Extract from third memoir.)—In mixture of two solutions, electromotive forces are always produced, some arising from hydrations, others from combinations. They may be distinguished and measured by means of water electrodes. The arrangement is this: Take a vessel containing acid solution, and place it in a cracked tube containing alkaline solution. In each of the solutions put a cracked tube filled with distilled water, in which is a gold or platinum plate perfectly depolarized. Before combination, and during the very short time in which it takes place, the acid forms a new hydrate with the water of the alkaline solution, and conversely; and two electric currents are produced, one from hydrations, the other from combination of the acid with the alkali. Now, water electrodes being used, there are two currents, due to hydration, which have an inverse direction to the two first, produced during combination, and neutralize them, so that there remains only the current due to electromotive force resulting from the combination of acid with alkali. Several applications of this principle are described. The method serves for comparing the affinities of substances in solution by separating the two kinds of electrical effects, and in such a way that it is not necessary to introduce gold or platinum electrodes into the solutions, which sometimes attack the metal, and may thus lead to error.

TARIFF BUREAU.

SEMI-MONTHLY CIRCULAR.

EXECUTIVE OFFICE,
WESTERN UNION TELEGRAPH COMPANY,
145 BROADWAY, NEW YORK,
March 15, 1874.

To all Offices on W. U. Lines:

The following changes and additions have been made since the date of the last circular:

GENERAL INFORMATION.

The town of Texarkana (given in last JOURNAL as in Texas) is on the State line, between Texas and Arkansas. The P. O., however, is in Arkansas. Communications should therefore be addressed Texarkana, Ark.

Leesburg, Ga., re-opened, square 238.

Allendale, Ill., closed.

Business for the following other line offices in Nebraska will hereafter be sent *via Plattsmouth* only; "tariff for other lines" from Plattsmouth as given below:

Ashland,	85 and 8	De Witt,	95 and 7
Crete,	75 " 5	Junata,	155 " 10
Dorchester,	85 " 6	Lowell,	165 " 11
Fairmount,	110 " 7	Harvard,	140 " 9
Grafton,	190 " 8	Exeter,	100 " 5
Omaha Junction,	85 " 8	La Platte,	35 " 8
Waverly,	50 " 3	Louisville,	35 " 3
Beatrice,	105 " 7		

The following is a revised list of officers on other lines in Nevada, with tariff for other lines from Reno and Elko.

Beowawa,	50 +25 Elko.
Brown's Station,	60 +30 Reno.
Carlin (Reopened),	30 +10 Elko.
Golconda,	60 +30 Elko.
Halleck,	30 +10 Elko.
Hot Springs,	50 +25 Reno.
Humboldt,	85 +30 Reno or Elko.
Lucin,	60 +30 Elko.
Mill City,	85 +30 Reno or Elko.
Raspberry,	85 +30 Reno or Elko.
Rye Patch,	85 +30 Reno.

Verdi (Reopened as other

Lines.) 30 +10 Reno.

White Plains, 60 +30 Reno.

+ For each additional five words or less.

Tecoma, Nev., closed.

Messages for Ocean Grove and Asbury Park, N. J. (Summer offices now closed), and for Ocean Beach, N. J., should be sent and checked to Squan, N. J., from which point they will be delivered at a charge of 25 cents for each message.

Athens, N. Y., reopened.

Under Executive Order No. 154, messages for the following named offices in New York will be counted as containing three words for date, in addition to the body words of the message:

Arcade,	Yorkshire Centre,
East Aurora,	Machias,
Elma,	Ischua,
Holland,	Portville,
Protection,	Franklinville.
So. Wales,	

Town Line, N. Y., closed.

Deshle, O., should read Deshler.

Business for Harrisburg Stock Yards, Pa., will hereafter be checked to Harrisburg.

Oakdale, Pa., in square 151, should read Oakdale Station, Allegheny Co.

Naples, Pa., changed to Sandy Lake.

Under Executive Order No. 154, messages for the following named offices in Pa. will be counted as containing three words for date in addition to the body words of the message:

Eldred,	Port Alleghany.
Larabee,	Keating's Summit, McKean Co.
Rutherford, Tenn.,	re-opened.

NEW OFFICES.

361 Bradford, Ark.

399 Brown's Valley, Ind.

971 Camden, Ind.

399 Darlington, Ind.

263 Griffins, Ind.

502 Axtel, Ka.

339 Arlington, Ky.

• Bradley, Mich.

• Kingsley, "

• Martin, "

• Manton, "

• Mayfield, "

• Sand Lake, Mich.

• Traverse City, "

• Walton, "

25 2	269	Grand Rapids.
60 4	269	"
35 2	269	"
60 4	269	"
60 4	269	"
25 2	269	"
60 4	269	"
60 4	269	"

140 Sandy Lake, Pa.

321 McNairy, Tenn.

494 Elgin, Texas.

* Mechum's River, Va. 40 2 96 Richmond, Va.

ATLANTIC CABLE BUSINESS.

We are notified that messages for Turkey, if written in code or cypher, will not be accepted by the Turkish Government.

CUBA CABLE BUSINESS.

We are notified that communication by Cable between Jamaica and Porto Rico is now restored.

WILLIAM ORTON, President.

TELEGRAPHERS' MUTUAL BENEFIT ASSOCIATION.

ACKNOWLEDGEMENT OF RECEIPTS FOR ASSESSMENTS NOS. 55, 56 AND 57, UP TO AND INCLUDING MARCH 10, 1874.

5, 17, 25, 26, 28, 29, 37, 42, 52, 53, 56, 59, 60, 64, 65, 74, 77, 86, 88, 90, 91, 95, 101, 108, 113, 122, 133, 140, 145, 157, 211, 215, 217, 220, 226, 235, 245, 254, 267, 269, 274, 276, 277, 286, 301, 302, 312, 342, 349, 351, 352, 380, 381, 383, 385, 391, 416, 426, 464, 509, 516, 526, 528, 536, 546, 547, 549, 564, 576, 579, 587, 603, 615, 636, 661, 672, 708, 715, 721, 734, 740, 741, 742, 769, 775, 789, 799, 821, 832, 873, 915, 917, 923, 943, 976, 977, 996, 1001, 1023, 1024, 1028, 1039, 1040, 1054, 1061, 1081, 1088, 1090, 1126, 1144, 1147, 1148, 1154, 1167, 1173, 1174, 1175, 1178, 1183, 1199, 1200, 1205, 1210, 1225, 1232, 1233, 1245, 1259, 1260, 1266, 1298, 1300, 1306, 1325, 1329, 1343, 1357, 1364, 1365, 1394, 1402, 1403, 1404, 1409, 1410, 1412, 1440, 1484, 1489, 1517, 1518, 1524, 1527, 1532, 1554, 1568, 1571, 1572, 1589, 1590, 1591, 1615, 1630, 1635, 1653, 1697, 1698, 1729, 1735, 1736, 1790, 1809, 1811, 1812, 1818, 1831, 1852, 1862, 1869, 1881, 1894, 1908, 1919, 1943, 1944, 1950, 1970, 2019, 2020, 2021, 2027, 2029, 2030, 2036, 2049, 2069, 2073, 2086, 2097, 2099, 2114, 2118, 2133, 2135, 2136, 2142, 2158, 2160, 2162, 2164, 2169, 2172, 2174, 2178, 2179, 2186, 2187, 2190.

ASSESSMENT NO. 55.

15, 21, 23, 188, 268, 289, 303, 553, 636, 662, 722, 787, 858, 859, 870, 932, 1267, 1276, 1516, 1648, 1742, 2101, 2119, 2197, 2130, 2139, 2149, 2153, 2154, 2155, 2156, 2157, 2159, 2163, 2163, 2165, 2166, 2167, 2168, 2170, 2172, 2175, 2176, 2180, 2181, 2182, 2183, 2184, 2185, 2188, 2189, 2192, 2198.

ASSESSMENTS NOS. 53 AND 54.

17, 37, 93, 95, 143, 178, 182, 217, 237, 428, 429, 447, 490, 495, 497, 499, 500, 503, 504, 505, 506, 507, 508, 597, 671, 769, 789, 890, 930, 977, 993, 1023, 1083, 1104, 1130, 1132, 1137, 1224, 1238, 1254, 1256, 1488, 1495, 1496, 1553, 1646, 1677, 1812, 1729, 1736, 1743, 1810, 1812, 1921, 1925, 1994, 2005, 2056, 2105, 2115, 2132, 2194.

ASSESSMENTS NOS. 49, 50, 51 AND 52.

447, 490, 495, 507, 789, 1187, 1488, 1736, 1937, 2056, 2105, 2115.

MISCELLANEOUS.

49.—856.
50.—178, 856, 2132.
51.—95, 178, 890, 1028, 1038, 2132.
52.—95, 178, 1028, 1038, 1813, 2132.
54.—39.
55.—15, 188, 636, 722, 742, 1648, 2 01, 2189, 2140.

OBITUARY.

SAMUEL PORTER.

In the death of Mr. Samuel Porter, a brief announcement of which appeared in the JOURNAL of March 2d, the telegraph has lost an early pioneer, and the profession a member of great worth and ability.

The telegraphic record of Mr. Porter dates back prior to 1844, to the time when Morse was engaged in perfecting his system. He frequently assisted in the experiments of that distinguished inventor, and when the feasibility of the Electro-Magnetic Telegraph was publicly demonstrated on the line between Washington and Baltimore, he entered into the infant business, and thenceforth his best energies were devoted to its advance and development.

After assisting in the construction and opening of the line between New York, Albany and Buffalo, in 1845, he constructed and opened the Buffalo and Toronto line, stretching the first wire across the Niagara River in 1846. He also built the first line that extended the wires across the St. Lawrence into Montreal. Since that early date in the telegraphic era, he has taken a leading part in the construction and opening of lines in the Northern and Western States. In 1852, he originated the project of a ma-

rine line between this city and Sandy Hook. A company was organized under the presidency of Ellwood Walter, Esq., and a line was built by Mr. Porter and Clarence Livingston. This has taken the place of the old signal telegraph, and by it a knowledge of the movements of vessels some miles distant from the Highlands is immediately conveyed to this city.

Mr. Porter built the first competing lines from Chicago to Omaha, St. Paul, and important points in the West.

Two years ago, after opening telegraphic offices along the Buffalo, New York and Philadelphia R.R., and getting it into successful operation, he was obliged to resign his position, and from that time has been unable to attend to business.

Mr. Porter's death occurred at Albion, N. Y. Feb. 23d, in the fifty-fifth year of his age. The remains were taken to Geneva, N. Y., for interment

D. N. BARNEY.

At an executive meeting of the Western Union Telegraph Co., held at 145 Broadway, New York, March 11, 1874, the following resolutions in reference to the decease of D. N. Barney, Esq., were unanimously adopted:

Whereas, The sad announcement has been made to the Executive Board of the Western Union Telegraph Company of the sudden death, on Sunday, the 8th inst., of D. N. Barney, Esq., at the Windsor Hotel, New York, it seems due to the memory of an associate in labor, and to one so deservedly regretted and esteemed, that we enter upon the minutes of this Company our sense of the loss sustained by us and the community by the unexpected providence which has removed him from our companionship, and closed so suddenly his earthly pursuits and toils.

Resolved, That we record our loss of our distinguished friend because of the kindness and urbanity which so eminently distinguished him, both in his social intercourse as a gentleman and friend, and as a member, during many years, of the Board of Directors of this Company. We record, also, our sense of the gratitude due to the departed for the influence of his presence and counsel, which were of inestimable value in shaping the policy of this Company, which always gave impressiveness to its deliberations, and inspired a feeling of security in the conclusions to which his finely-balanced mind and conservative yet enterprising habits of thought so largely led. We record, also, our general sense of loss felt by all men of enterprise and public spirit in our community in the death of a man in the apparent prime of his life and influence, so largely connected with and influencing so powerfully the great enterprises of the nation.

Resolved, That we tender our sympathy to the family of the deceased, and direct a copy of these resolutions to be handed to them.

GEORGE H. CALKINS.

At a meeting of the Telegraphers of the City of Cleveland, Ohio, held March 8th, 1874, at Union Depot, to commemorate the memory of their departed and esteemed associate George H. Calkins, the following resolutions were adopted, viz:

Whereas, We are called together to mourn the loss of our friend and comrade George H. Calkins, who died of small-pox at the residence of Mrs. A. F. Stowe, No. 182 St. Clair street, March 4th, 1874.

Resolved, That we deeply mourn the loss of our companion, and tender to his afflicted mother and sisters our heartfelt sympathy and condolence, in their loss of a kind and affectionate son and brother.

Resolved, That to Mrs. A. F. Stowe we desire to return our sincere thanks for the motherly care and unremitting attention given our deceased brother during his illness.

Resolved, That the telegraph office in Union Depot be draped in mourning for thirty days, and that a copy of these proceedings be furnished to his relatives, and that the same be published in the Cleveland City papers and JOURNAL OF THE TELEGRAPH.

THE ANGLO-AMERICAN TELEGRAPHS.

The meeting of this Company, held yesterday, cannot but be considered as of the most satisfactory character. The proposal of the Directors to employ a portion of the earnings, as well as the reserve, and the length of cable on hand, for the purpose of laying a fifth cable, was unanimously adopted. This proposal, if properly considered, illustrates in a remarkable manner the soundness of the Company's financial position. No better evidence as to the stability of the undertaking could be offered or desired than that the Company's property should thus be augmented entirely out of revenue. Allusion was, of course, made at the meeting to the subject of the proposed light cable. The opinion expressed by Sir James Anderson, whose practical experience commands the fullest consideration, should satisfy every unbiassed person of the almost utter impossibility of laying a light cable across the Atlantic. Attention was also directed to the fact, that, in the prospectus of the new Company, it was stated in regard to cables covered with iron and surrounded with hemp, that "as soon as the iron begins to rust, the strength of the cable both in iron and hemp becomes gradually reduced, until the whole strength of the outer covering is destroyed by corrosion." The best possible answer to such a statement is found in facts which must have come promptly under the notice of two, at least, of the Directors of the Light Cable Telegraph Company, who are also Directors of the Submarine Telegraph Company. "The latter Company is at present working a cable covered with iron and surrounded by hemp, which, originally laid in 1851, has continued in good order since that date. That a statement like the above should be put forward publicly by Directors of the Submarine Company, is seriously to be regretted, giving indication as it does that those who make such assertions have not seriously considered the proposal to which they lend the sanction of their names.—*Railway News*, Feb. 14.

PANAMA AND SOUTH PACIFIC TELEGRAPH.

The ordinary meeting of the shareholders in this Company was held on Wednesday, 11th ult., at the Cannon street Hotel, London, Mr. T. Hughes in the chair.

The Chairman, in moving the adoption of the report, which was entirely occupied with the details of the Chancery suit going on between the Company and the contractors and Sir C. Bright, and the efforts of the Directors to bring that suit to a termination, said he regretted to say that when the report was issued the Company was just in the same position as that in which it had been this time twelvemonths. That unfortunate suit with Sir C. Bright had been prosecuted with all the energy of which the Directors and the legal adviser were capable, and they had done everything in their power to prevent a day's delay in bringing it to a hearing. That was all that stood in the way of the Company's being wound up and the shareholders having their money restored to them. He was happy, however, at being able to state that since the issue of the report an order had been made in Chambers for the cause to be at once entered on the list, and as a consequence of that order the hearing might come on any day during the after sittings between this and the end of the month. They were therefore within sight of that which they scarcely looked forward to at the commencement of the year—the satisfaction of having their business settled and the Company's affairs wound up. It was scarcely necessary for him to go into any of the questions raised in that suit; they remained for judicial

decision, but he could only hope that the result would be perfectly satisfactory to the shareholders. By the articles of association, the Company were compelled to have four Directors. The two Directors who retired, Mr. Pezet and Major-General Smith, did not desire re-election. The consequence was that only three Directors would be left, and therefore it would be necessary to appoint a gentleman to serve as Director during the remaining short existence of the Company. He was happy to say that Mr Reed, who was a properly-qualified shareholder, had consented to be put in nomination for a seat at the Board. In compliance with the wish expressed by the shareholders at the last general meeting, Sir Cecil Beadon had been elected a Director. The interest obtained on the money in the hands of the Board during the past year was nearly double that of the previous year, the interest in the past year amounting to £790, as against £441 in the previous year, and that had been owing to the excellent management of the Secretary and Manager. The expenses had also been reduced by upwards of £111 since last year. This would show that, as far as possible, the Directors were looking after the interests of the shareholders.

Mr. Reed said that, if elected on the Board, he should do all in his power to bring about an amicable settlement with the contractors.

The Chairman said that the views of Mr. Reed exactly corresponded with those of the Directors, who would be pleased, if such a thing were possible, to bring about a settlement. Every effort had, however, been made in that direction without avail.

Mr. Reed was then elected a member of the Board, and the election of Sir Cecil Beadon to a seat at the Board was confirmed.

CUBA SUBMARINE TELEGRAPH.

The shareholders of this Company are about to take action with regard to their affairs similar to that which has been so successful in the case of the West India and Panama lines. A circular has been issued bearing the names of the leading shareholders of the Company, in which they state their "wish to canvass the views of their fellow shareholders as to the prudence of adopting the policy of united interests. You are no doubt aware that the direction of the Panama Company is now in the hands of some of the most experienced men in the telegraphic world, and to bring our system under their powerful administration cannot but tend to an improvement in the value of our property. Amongst some of the advantages to be obtained by this consolidation, we may mention:

"1. That a well-equipped repairing ship could be established at a minimum cost on the West India station, so as to insure us against the repeated and prolonged interruptions to which we have hitherto been subjected.

"2. A proper system of supervision could also be economically established by means of experienced and well qualified inspectors, this being absolutely necessary to secure an efficient service.

"3. A thorough system of rates by which we should secure a fair share of the productive traffic, not only from South to North America, but also from the West Coast to England, *via* the Western Union Company's lines.

"4. The self-evident advantages of amalgamation, the abolition of the cumbersome machinery of separate Boards of Directors, and their attendant officials, which more especially apply to us, whose capital is limited to the small amount of £160,000.

"In this preliminary circular we do not wish to bind the shareholders to the precise terms upon which we should join our neighbors, but we think it might be advisable to accept for our £160,000 a like amount in the Ten per Cent. Preference Shares of the West India and Panama Company."

CABLE COMMUNICATION BETWEEN JAMAICA AND PORTO RICO.—Advices from Kingston, Jamaica, of February 21st, state that the West India and Panama Telegraph Company have laid a second telegraph cable to Porto Rico from Jamaica; but this time by the south side to Ponce. There is no land line belonging to the Company, and the Government refuses the use of the new line to the Company. Messages, therefore, between Ponce and St. Juan travel in the mail bags, and cause a delay of thirty-six hours in the passage.

THE Brazilian Submarine Telegraph Company have notified that their cable between Madeira and St. Vincent is expected to be laid in March next, and that on the announcement of its opening for traffic, pending the restoration of the Madeira-Lisbon section, messages for South America and the Cape of Good Hope will be received to be sent by wire to Lisbon, thence by post to Madeira, from there to St. Vincent by telegraph, and finally by post to their destination. The rate from Great Britain for messages of twenty words to St. Vincent will be £2 17s. 6d., including agency and postage. When the Lisbon-Madeira section is restored, the messages will be sent directly by wire from England to St. Vincent, and thence by post at the same rates, with an additional charge for postage of 1s. 6d.

THE Directors of the Submarine Telegraph Company report that the net profit for the six months ending the 31st December last will enable the Directors to recommend a dividend at the rate of 10½ per cent. per annum, and to add 5 per cent. of the gross receipts to the reserve fund.

THE screw steamer Ambassador, 1,951 tons, having on board 588 knots of telegraph cable, passed Dartmouth on the morning of February 20th, on her way to Brazil. The cable forms part of that contracted for by Messrs. Siemens Brothers for the Platino-Brazilera Telegraph Company, to connect Rio de Janeiro with Uruguay.

THE Directors of the Telegraph Construction and Maintenance Company propose paying a dividend of 20 per cent. (£2 8s. per share), in addition to the interim dividend of 5 per cent. already paid, carrying forward about £19,000. At the corresponding period of last year the dividend was 24s. per share.

THE total number of messages forwarded from postal telegraph stations in the United Kingdom during the week ending February 7, 1874, and during the corresponding week of 1873, were respectively: Week ending February 7, 1874, 367,176; week ending Feb. 8, 1873, 298,990; increase in the week of 1873 on that of 1874, 78,186.

THE total number of messages forwarded from postal telegraph stations in the United Kingdom during the week ending February 14, 1873, and during the corresponding week of 1873, were respectively: Week ending February 14, 1874, 352,426; week ending February 15, 1873, 292,447; increase in the week of 1874 on that of 1873, 59,979.

ACCORDING to the official return of exports, the value of telegraphic wire and apparatus forwarded from the United Kingdom, for 1873, had increased from £405,318 in the previous year to £2,359,563.

AMBER is a resinous substance, yellow, hard, bitter, shapeless and glossy. It has been variously supposed to be a vegetable gum, a fossil, and an animal product. It is probably formed by a species of ant that inhabit pine forests. The bodies of ants are frequently found in its substance. It takes a fine polish, and is used for ornamental purposes, and as a basis for a fine varnish. By friction it readily becomes electric.

Journal of the Telegraph.

This Journal is issued on the 1st and 15th of each month. Its circulation is over 8,000. It goes to every State, Territory and Province on the Continent. It has become a necessity, and is always welcomed as a friend. No better medium for advertising exists.

TERMS:

TWO DOLLARS PER ANNUM IN ADVANCE.

Address—

JOURNAL OF THE TELEGRAPH,

Western Union Telegraph Company,

145 Broadway, New York.

NEW YORK, MARCH 16, 1874.

OWING to an error in printing the book of tariffs now in operation, Valparaiso, Indiana, was placed in the range of square 180. It should have been 290. The error was at once corrected through the JOURNAL, and since then it has been alluded to more than once in our columns. The manager at Valparaiso complains that many error sheets reach him, which are occasioned by the neglect of offices in not making the correction. Will managers please correct their books, and thereby avoid much annoyance and unnecessary labor?

We desire to call the attention of managers of offices, particularly those known as railroad and country offices, to the fact that in allowing persons not connected with the service free access to their offices they violate an important rule. No improper motive is imputed, but it will be readily admitted that the condition of secrecy—one of the most valuable of the attributes belonging to the telegraph—is not properly observed at an office where loungers are to be seen around an operating table.

NEW FEATURE IN STOCK REPORTING.—The Gold and Stock Telegraph Company have introduced the system of announcing on their ribbons the hour of 2:15 P. M., which, by a rule of the Governing Committee of the Stock Exchange, is the legal time for deciding deliveries and receipts of all securities. The following is the order to be observed:

At 14 minutes after 2 P. M. the word "Time" will be printed, and immediately thereafter the printing lever of every instrument will commence and strike 15 distinct beats or seconds of time, made by the swing of the pendulum of the clock; upon the close of the 15 beats it is then a quarter past 2 o'clock P. M. After which, and before the resumption of business, "2:15 P. M." will be printed upon the paper ribbon.

By an ingenious contrivance, wires connecting with the instruments of the Company are brought into such connection with the pendulum of the regulator in Wm. F. Ladd's store, on Wall street, that the 15 beats represented on the ribbons by dots are made by the action of the clock.

HAS THE ART ADVANCED?

In the recent decision of Justice Breese of the Supreme Court for the North Division of the State of Illinois, in the matter of an alleged error in a message from New York to Chicago, the following language occurs:

"Modern Telegraphy is not now an infant art. * * * In its infancy it scarcely ever failed to perform its office. Thirty years have witnessed vast improvements in the art, a higher knowledge of the subtle agent called into use, more finished instruments, and almost perfect skill in those who operate them; so that, setting aside atmospheric causes, which have not yet been provided against, it may be asserted as an incontestable truth, that, given a line of wire, properly established, the most perfect instruments and skillful operators, who exercise their skill with proper care, a message, started at Chicago for New York, is as sure to reach its destination, exactly in the words and figures in which it was started, as the lightning is sure to strike the object which attracts it."

The margin for editorial comment on public statements such as the above is too limited to permit more than a very brief notice, and we confine ourselves, at present, to the inquiry, has the art of telegraphy advanced, and in what respect has this advance been shown?

Telegraphy had its practical origin in the Winter of 1845, the Philadelphia office having been opened about the close of that year, and being the first commercial office opened in the nation. In the few months following that date, the business was light and transmission slow and timidly performed. The Morse register was used, and instruments at both termini were employed, the one to receive the recorded message, the other to examine what had been sent and how transmitted. In these early stages of the art, in this power of review of an operator's work under his own eye, and the assurance thus secured that he had faithfully done his duty, lay a perfection, so far as it went, never since excelled, and which, indeed, has now no counterpart. The proof of his work is elsewhere. Unconsciously, therefore, the infant telegraph was, in a very important respect, in advance of its maturity. We are not discussing the merit or demerit of receiving by sound, yet we are not sure but that, should the Morse system be continued many years, it may be found to be important to the operator, if not to the Company, to restore, in some simple method, this record of an operator's performance. Should a system of fines for errors ever be generally imposed by telegraph companies, operators may yet, for their own protection, devise and use machinery to record and permanently prove their own work. Certainly, thirty years has not given a substitute for this tall-tale of its childhood. As things are now, no man can be distinctly convicted of error, and so two men are accused of a fault which neither can disprove. In this there is, at least, no evidence of advance.

In the introduction of the art, great care was exercised by operators who attempted the work of transmission. For some time Mr. Vall, Mr. Morse's partner, would allow no one to attempt it but himself. A certain painstaking method of manipulation was insisted on, amounting to mechanical accuracy, which, to a considerable extent, was acquired only

by the earliest operators. So marked, indeed, was the careful training of these days, that the identity of an operator could not be proven by his manipulation. Now, it is a singular fact that there are now as many styles of manipulation as there are of men or chirography, and the identity of an operator can be detected by the handling of the key. It requires time for two operators, though skillful, to get the hang of each other's methods of manipulation. Certainly there are no data to prove that, in the act of modern manipulation, any advance has been made in the matter of accurate formation of characters in all these thirty years.

In the matter of the comparative advantages of the old register and the reception by sound, we have only to say that, as an argument, it would be difficult to sustain the position that one can hear more correctly than he can see. We do not now discuss that point. We acknowledge the practical advantages of the sound system. The register, for all heavy business, was abandoned as long ago as 1850, so long ago that the change does not now enter into the present question. It would be difficult to say where in the matter of machinery, except in laying aside the register, improvement began. We venture to say none has been made save perhaps in a more careful adaptation of the resistance of relays to the circuits on which they are employed.

Of course we omit mention here of the various ingenious Repeaters which have been invented to take the place of the old hand switch, and by which, distant transmission has been rendered less laborious, yet without any new power of projection or safety in manipulation. Neither do we take account of the Duplex System, which, while it practically makes two wires out of one, leaves modes of manipulation unchanged, and the obstructions by the atmosphere and otherwise, rather multiplied than diminished. Improvement, so far as protection to transmission is concerned, has been chiefly, and almost solely, in the vigorous maintenance and increased perfection and perpetuity of the outside structure.

THE PROPOSED TEXAS MILITARY LINE.—The Chief Signal Officer informs the House that the proposed military telegraph line in Texas would be 1,275 miles long, and would cost \$100 per mile, provided the soldiers construct it. To keep it in repair, he estimates would cost \$8 per mile, annually. Both the military authorities and the Texas delegation are urging the construction of the telegraph as a means of protecting the frontier against Indian raids.

THE recent loss of three large passenger steamships has led somebody to propose an effectual means of guarding against such fatal accidents. Each large passenger ship should carry a small but powerful steam launch. In foggy weather this launch should be sent ahead a few hundred yards, being connected with the passenger ship by a flexible telegraph cable, provided with an electric battery, so that the signals might be constantly transmitted from one to the other. The launch should also carry an electric or other strong light, and be provided with a powerful steam whistle. On meeting with ice or with vessels, or unexpectedly approaching the coast, it would be comparatively easy to stop the launch and give warning in time to save the passenger ship from harm.

THE NEW CODE OF RULES.

Before we begin the list of suggestions received on the subject of Rules, we present two cases just received from the office of the Auditor.

In a certain town, unnamed, lives a burgher of ample means, who had occasion to send a message to a man living a number of miles from another telegraph station. He agreed to pay all charges, and the message was accepted and sent. The receiving station manager hired a conveyance, gave the driver strict orders to find the man addressed and make delivery, and watched him until the switch of his horse's tail was lost in the distance.

After spending a whole day, the man to whom the message was addressed could not be found, and late at night the messenger returned, and with him a bill of \$15 due for services of man and horse. To make the story short, for many such might be told, the sender refused to pay charges, and the Western Union Co. was minus \$15.

Another. A woman came to an office and sent a message to a brother four miles from a distant town, informing him her husband was dead. She guaranteed payment of all charges, but sent the message and charges collect. Brother wouldn't pay, but being offered the message, took it. This was Friday. Receiving manager sent notice of refusal to pay charges, next day. Woman was notified by sending office Monday. Woman wouldn't pay because too long time had elapsed before asking for it. Brother, regretted his refusal meanwhile, and he went to receiving office to pay charges. Manager wouldn't take pay because he had charged the sending office. Woman was then applied to, who wouldn't pay because her brother's money was refused. About a score of messages between managers were sent and lost. Verdict was finally rendered against the receiving manager, who had to pay the charges because of want of promptness in notifying refusal to pay.

To us it seems time that some of this constant source of trouble was abated. We commence our suggestions, therefore, with one on this subject which we will not even dignify with a number, but ask attention thereto and careful criticism. A fair schedule of charges for this class of service, universally applicable and just, can only be reached by united testimony from managers of offices.

DELIVERY BEYOND FREE LIMITS.

Messages may be accepted for delivery beyond the limits of free delivery by prepayment therefor on the following terms:

Distances not more than half a mile beyond free delivery, 25 cents.

For distances over half a mile beyond free delivery and not more than two miles from any office, 50 cents.

For every additional mile, one dollar.

When such prepayments have been made, and a careful address has been given, prompt delivery of such messages to be effected on the most favorable terms for the Company, and always within the terms named. Should any such service be found impracticable within the sum paid, the delivery nevertheless to be made and the facts reported. The Company will assume no responsibility for special delivery of messages beyond free limits.

Messages of this character to bear upon them, immediately following the ordinary check, the words "special delivery mile prepaid." 1 mile will denote the 25 cent charge; 2 miles, the 50 cent charge; 3 miles, one dollar and a half; 4 miles two dollars and a half, and so on. Such added words to form part of the message—and be charged for.

We make this suggestion roughly, to invite criticism.

SUGGESTIONS.

We have received, to date, the following:

From Augusta, Ga.

- 1.—Modification of Rule 1, so as to give specific directions respecting opening of receiving and operating departments; also as to time—whether local, or railroad, or central city; also Sunday hours.
- 2.—The benefit of examples in explaining rules.
- 3.—Rule 20, good, but needs limitation to prevent abuse.
4. Rule 28 should regulate order of priority messages, *i. e.*—"Cable," "C. N. D.," "Reds" of night before, office messages, etc.
- 5.—Regulations needed for transmission of "Reds."
- 6.—Rule 37; instructions needed for new operators how to call offices.
- 7.—Rule 48 is abused.

From New York.

- 8.—To precede messages by the check immediately after number.
- 9.—To recognize the prefixes New, St., San and La, before names of places, as part of the word before which they stand.
- 10.—Against any blank dividing lines into arbitrary spaces.

From Springfield, Ill.

- 11.—Rule requiring all messages to be delivered on the blanks of the Company, properly dated and timed, and written in ink.

From New York.

- 12.—Rule requiring collect messages to be delivered even if payment is refused.
- 13.—Advantage of telegraphing the amount of tolls in getting answers by messengers.
- 14.—The advantage of placing a card in every message stating the cost of an answer.
- 15.—To print on the message blank of a message requiring reply, "The cost of a ten-word reply to this message will be....and....cents for each additional word. The messenger will convey it to the office if desired."

From Syracuse, N. Y.

- 16.—The necessity of discriminating properly between the terms "insured," "repeated" and "duplicated" messages.
- 17.—To have it understood in Rules that the operator receiving an "insured," "repeated" or "cable" message shall transmit the same upon the other circuit.
- 18.—To make 20 words basis of charge and count all but word "answer."
- 19.—To charge for messages asking answer.
- 20.—To send the check after the Period.
- 21.—To regulate distant delivery and authorize retention of messages to a distance, when not provided for.
- 22.—To change word "must" in Rule 12 to "may."
- 23.—To abolish one of rules 52 and 92.

From Wheeling, W. Va.

- 24.—To change 44 blanks so that the message would be written with the length of the blank instead of across it, thus distinguishing it from a full rate message.

From Dunkirk, N. Y.

- 25.—Rule requiring a careful specification of checks.
- 26.—Rule 20, to require all free messages not properly checked to be held by receiving operator for correction. Messages checked "D. H. no copy," "D. H. no account," to be forbidden.
- 27.—Meaning of words "frank," "pass," "stamp," to be defined.
- 28.—Term "via" not understood, nor the fact that the via office is the office to be checked.
- 29.—Directions "hurry delivery," "deliver by special messenger, collect charges, guaranteed," to be paid for.
- 30.—Special instructions with reference to punctuation in Rule 24.
- 31.—Necessity of timing messages and requiring operators to give initials, and office signal.
- 32.—Requiring notification of non-delivery to be sent to originating office by telegraph.
- 33.—Rule 77 not to be used to neglect of Rule 12.
- 34.—Rule 86 should read, second line, page 89, "Showing the daily amounts credited by you during the month on messages to or from such office." Third paragraph should instruct of-

fices explaining discrepancies to send copies of messages on which difference occurs, whenever practicable to do so. Rule 87 shows the necessity of doing so.

From Boston.

- 35.—To follow cable rules in counting figures.

From Salt Lake City.

- 36.—Rule. No message will be sent collect except an answer to a message marked 88. Managers will not attach 88 to a message unless reply guaranteed by responsible party or amount deposited sufficient to pay for a ten word message.

An answer to be sent collect under signal 88 must be sent within 24 hours from the receipt of the message. Office managers receiving deposit for a 33 message will refund if no reply received in 48 hours.

- 37.—Rule. In case of non-delivery of a message the reason will be written upon the envelope of the message, and postal card will be dropped in P. O. asking party to call at telegraph office for message, and also postal card will be sent to originating office giving notice of non-delivery. No message will be sent in regard to it unless called for by signal 84.

- 38.—Rule. Office messages sent for customers making inquiries in relation to any message must be paid for by party asking such service, payment to be refunded if failure is found to have been the fault of the Telegraph Co.

- 39.—Rule. When an office has good reason to believe there has been some error or delay on the part of this Company an office message may be sent, signed by the manager or chief operator, and such request for correction, repetition, or explanation will be complied with by other offices as quickly as possible. When, in the judgment of the receiving office, such office messages are unnecessarily sent, the case will be reported to the District Superintendent.

From New York.

- 40.—Rule regulating message numbers. Shall they be numbered to repeating stations? Shall office messages be numbered?

From Muscatine, Iowa.

- 41.—Words "paid" and "collect" to be repeated back before giving O. K.

From Baltimore.

- 42.—Figures to be allowed.
- 43.—Rule 7. Require receiver to put his initials on all messages received by him.
- 44.—"Rule 12" and "Rule 13" to take the place of Signals 88-84.
- 45.—Rule 39. When circuit is open more than one minute use ground wire, and report to District Office which side open, signing and waiting long enough for reply.
- 46.—Special delivery messages not to be trusted to unknown persons.
- 47.—Add to Rule 75, "The amount of tariff 'for other lines' will not be entered in the column of check report, 'This office checks other offices.' This column is for offices which pay out to other lines, and for special delivery, etc."
- 48.—Add to Rule 86, "Send by mail, in envelope No. 5, writing the name of your office in space provided for that purpose."
- 49.—Add to Rule 88, "The amount remitted or explained must be written under their proper head."
- 50.—Rule 94. Notice referred to should be given to Superintendents.

From Philadelphia.

- 51.—Recommending spaced blanks.
- 52.—Blank No. 1 not legally binding without contract thereon.
- 53.—Emphasize words under space for address. "Give full address."
- 54.—No. 2 blank should be No. 1.
- 55.—Tariff book to show office hours.
- 56.—Index book of rules copiously.

From Springfield, Mass.

- 57.—Abolition of the "Red" system.
- 58.—Prepayment of all messages except answers.
- 59.—Strict observance of Rule 54.
- 60.—Making it compulsory to send "'tis ana." with answers.

From Boston.

- 61.—Omit last five lines of Rule 54.
 62.—To allow figures in press reports, and arrange signals for dollar mark and decimal point before the cents.
 63.—Report of charges for special delivery to be charged for at half rates.

From Fort Monroe.

- 64.—Rule 18 unnecessary, because provided for by Rule 53. Suggests the following: "When a person sends a message requiring an immediate answer, and correspondent cannot furnish the answer promptly, the reason for delay may be furnished by the manager at half rates, etc."

From Black Hawk, Col.

- 65.—Instructions needed for new managers, as follows: "Monthly report consists of No. 4 and 7 blanks, accompanied by No. 10 blanks, properly filled, for every item of expenditure. No. 38 blank when there has been any free business, accompanied by original copies of free messages sent. Cable reports to be accompanied by originals." This would aid comprehension.
 66.—Positive order needed to enter tariffs promptly, so as to avoid check errors, and send JOURNAL circular checked with report, to show that entries had been made. "When I came here, found one entry in ten months."

From Linesville, Pa.

- 67.—All answers to be guaranteed, but person answering to be at liberty to pay.

From Baltimore, Md.

- 68.—Purport of Rule 18 to be printed conspicuously on Blank 2.
 69.—Superintendents to make inquiry about delivery at discretion.
 70.—Answers to 34 messages to be addressed to managers thus: Your* (No.) 22.92 (meaning delivered) 12:15 (time)—or, where message has been delivered to a partner or member of a family, 13.92—John Smith. When no name given, delivery understood to have been made to person addressed.
 71.—Book of rules to give list of punctuations and their signs, and be charged as words.

From Union Stock Yards, Ill.

- 72.—Rule 77 should make manager chargeable with neglect in obeying it to pay for uncollectible messages.
 73.—Collect messages to show tolls.

From W. Newton, Pa.

- 74.—To insist on full addresses.

From Corn Exchange, New York.

- 75.—Rule allowing figures to be used in the body of a message, and be charged for each one word.
 74.—Respecting average amount of business to be done to secure a monthly credit. This is not a subject of general rule.

From Cleveland, O.

- 75.—Recognizing messengers as receiving clerks.

From Baltimore, Md.

- 76.—Specifying 8 A. M. to 8 P. M. as hours of opening and closing; exceptions to be made by special order.
 77.—"Reds" should be sent at any time wires are idle, and not held till closing hour.
 78.—Rules 20 and 26 conflict.
 79.—Offices to be compelled to exchange numbers, i. e., number succeeding last message sent as a clearing signal. This would save much useless calling, and many morning service messages, when wires are most needed.
 80.—Record of closing hours would be useful.
 81.—Insert "Dist. Supt." instead of Secretary.
 82.—Rule wanted governing responsibility of operators. Superintendent should be judge of party to be held.

From Lewes, Del.

- 83.—Instructions to linemen needed.
 84.—Imperative rule to managers on one-wire line respecting breaks.
 85.—Some latitude should be allowed in correcting orthography.
 86.—Violation of Rule 39 should be a capital offense.

From Reading, Pa.

- 87.—Rule 14 requires to be made clearer.

- 88.—Rule 82 should be more explicit, to have offices check with the connecting or paying out office instead of office where message originates. Give a good example. Will save many error sheet items.

From Washington.

- 89.—Stamps to be allowed to pay collect messages, and entered refund without notice to sending office.
 90.—Office messages should be numbered.
 91.—Responsibility of Company should cease with delivery.
 92.—Charge for punctuation and rules therefor.

From Philadelphia.

- 93.—Answers to D. H. messages to be either paid or sent collect.

From Boston.

- 94.—New heading for blank No. 1.

WESTERN UNION TELEGRAPH COMPANY.
 No. Sent by Rules of this Com-
 Check ... Received by pany, etc.

- 95.—Cleveland sends the following:

BLANK NO. 1, WESTERN UNION TELEGRAPH CO.
 Where From what By Check if
 from operator whom When paid
 Via
 From Cleveland, O., Feb. 21.
 To Mansfield, O., 21.
 Via
 If collect, check on this line.
 If D. H., check on this line.
 To

The blank for No. 2 is too complicated to insert. The idea is to give all checks before the message, and so vary their position that discrimination will be easy.

- 96.—Against branch offices on through circuits.

From Augusta, Ga.

- 97.—Importance of Rules 53 and 54, and need of envelopes with the words "Answer wanted" on them. Messengers should have an allowance for answers. Rule 77 needs enforcement.

From Buffalo.

- 98.—Quotations of stocks, markets, or from and to responsible parties, to be allowed to go collect.

Collect checks. The amount of tolls expressed in figures with the word "collect" written before and after the amount must be transmitted with every collect message. The figures denoting amount of tolls and the extra word "collect" must be counted and charged for.

Example:

BUFFALO, N. Y., March 9.

JOHN SMITH, 21 Wall Street, New York.

Meet me at the Metropolitan Hotel six o'clock to-morrow night.

13 collect, 59 collect. WILLIAM JONES.

- 99.—Every message received should bear upon the upper left hand corner of the blank the signal of the office received from, and the sending operator should write the signal of the receiving office upon the message immediately after the other usual "sent marks."
 100.—Rules 53 and 54 should be strictly enjoined, and all other service messages prohibited. Provision should, however, be made for inquiry by postal card in cases of complaint of non-delivery; notice of non-delivery to be filed with message.

BORN.

ASHDOWN.—At Germantown, N. Y., Feb. 19th, 1874, to James Ashdown, agent and operator, a son.

COLLINS.—At New York City, Feb. 23d, 1874, to P. Collins, Manager W. U. Tel. Office, "Allertons," a daughter.

HOTCHKISS.—At Mears, Mich., Jan. 21st, 1874, to E. M. Hotchkiss, Manager W. U. Tel. Office, a son.

MCDONALD.—At Halifax, N. S., March 2d, 1874, to David McDonald, telegraph operator, a daughter.

MARRIED.

McKEARIN-SMITH.—At the residence of the bride's uncle, Hoosick Falls, N. Y., Feb. 28d, 1874, by Rev. John Tatlock, P. McKearin to Miss Ella Smith.

MENTON-O'MARRA.—At Angola, N. Y., Jan. 22d, 1874, by Rev. T. Ledwith, Mr. Martin Menton of Hamburg, N. Y., to Mrs. Sarah O'Marra of Angola.

DIED.

CALKINS.—At Cleveland, O., March 4th, 1874, George W. Calkins, operator W. U. Tel. Co.

FIRMIN.—At Chicago, Ill., Feb. 27th, 1874, Horace L., eldest son of L. B. Firmin, General Manager Am. Dist. Tel. Co. of Chicago, aged 13 years.

HOOPER'S TELEGRAPH WORKS.—The report shows a profit of £89,789, after deducting £15,000 for depreciation of plant and machinery, and a further sum of £17,851 for depreciation on the two cable ships Hooper and Great Northern. After payment of the sum due to Mr. Hooper, according to the Company's contract with him, the amount available for distribution is £54,969. An interim dividend of 15s. per share, amounting to £18,750, was paid to the shareholders on the 19th July last, leaving a balance of £35,519 for division amongst them now. The Directors recommend a dividend of £1 per share, which will absorb £25,000, leaving a balance of £10,519 to be added to the reserve fund. This fund will then amount to £26,214. Taking the dividend paid in July, together with that now recommended to be paid, the total amount distributed to the shareholders for the year will be at the rate of 17½ per cent., free of income tax. The contract, referred to in the last report, with the Great Western Telegraph Company, was, by agreement, transferred to the Western and Brazilian Telegraph Company and the Central American Telegraph Company. The whole of the cables for the former Company have been most successfully completed, and accepted by that Company, and they are in full operation. The cables for the latter Company are in course of manufacture, and will be shipped on the return of the steamship Hooper. The Directors have obtained contracts, with concessions, subsidies, and guarantees, from the Cape, Natal, and Mauritius Governments for submarine cables from the Cape *via* Natal and the Mauritius to Aden. The Directors are now negotiating for the carrying out of these undertakings. An attendant steamship being essential for the purposes of the Company, the Directors have bought the steamship Great Northern, completely fitted with machinery for laying and picking up cables. This ship assisted in submerging the cables between Pernambuco and Parat, and is now chartered by the Western and Brazilian Telegraph Company. The general business of the Company is satisfactory.

TEMPERATURE ON THE EARTH.—In this country the earth's temperature is constant at a depth of about 50 feet, where the temperature is about 50° Fah. The rate of increase of temperature in our coal mines is generally 1° Fah for every 60 feet of depth. It is questionable, however, whether after a great depth the rate of increase does not prove more rapid than before. At the deepest coal pit in England, namely, that at Rosebridge, near Wigan, where the shaft is now 2376 feet deep, and is still descending, there the ratio of heat increase agreed with the ordinary rate down to the depth of 1800 feet, after which it became considerably more rapid. At the lowest point of the sinking the thermometer indicated 73° Fah.—*The Engineer.*

TELEGRAPHY IN COUNTY SCHOOLS.—To the Rev. W. D. Parish, vicar of Selmeaton, Sussex, belongs the credit of first successfully introducing and teaching telegraphy in a county school. This has been done by him, and the children have been examined by Sir James Carmichael and by officials from the Post-Office, who speak of the scheme as a marked success. The Telegraphic Department have lent them a printer and one-needle instruments, and the children learn their use very quickly. The new Postmaster-General has expressed high approval of the scheme.

NOTARIES PUBLIC were first appointed by the Fathers of the Christian Church to make a collection of the acts or memoirs of martyrs, in the first century.



Security Message Hook.

PATENT APPLIED FOR.

The damage from the loss of a single message will equip a line many times with our new Hook, which gives great security.

Price 30 cents each.

Price per dozen \$3.00.

LIBERAL TERMS TO THE TRADE.

GEO. H. BLISS & CO.,

41 THIRD AVENUE, CHICAGO, ILL.,

GENERAL AGENTS.

NOTICE.—In order to save express charges to numerous customers (at a distance), for our **CHAMPION LEARNERS** and **SHORT LINE APPARATUS**, we are about establishing various **AGENCIES** throughout the country, a list of which will soon be published. Those wishing Agencies will please send at once for circulars and terms.

PARTRICK, BUNNELL & CO.,

38 South Fourth St., Phila.

A SOUNDER FOR 30 CENTS.

THE "SNAPPER,"

A mechanical Sounder and Key combined, giving a remarkably sharp and clear sound. Weighs but half an ounce, and can be carried in the vest pocket.

Every Operator, Every Amateur, Every Student

Wants one. Sent post paid on receipt of Thirty Cents.

R. W. POPE,

Gold and Stock Telegraph Co.,
61 Broadway, N. Y.

COPPER

OFFICE AND MAGNET WIRE,

BRAIDED AND WOUND,

SINGLE and DOUBLE, with COTTON, LINEN, SILK;

Paraffined or Varnished, Compressed and Polished.
Manufactured and for Sale by

WESTERN ELECTRIC MANUFACTURING CO.,

CHICAGO.

SEE ADVERTISEMENT on another page

Of this paper, of the

"Champion Setts" for Learners' Uses,

For City Wires, and all Short Lines of Telegraph.

They are by far the best out, the cheapest, most substantial, and prettiest.

SPECIAL INDUCEMENTS TO AGENTS

Or purchasers of several sets.

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Connect with the lines of the **WESTERN UNION TELEGRAPH COMPANY** at Pollard, Ala.

Governed by the same Rules and Regulations as the Western Union Telegraph Company.

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Red Star Line

PHILADELPHIA AND ANTWERP,

Appointed to carry the Belgian and United States Mails.

From Philadelphia.		From Antwerp.	
VADERLAND,	Feb. 25.	VADERLAND,	Jan. 30.
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PRICES OF PASSAGE IN CURRENCY.

First Cabin,	\$90.	Second Cabin,	\$60.
Steerage,	\$30.		\$30.

Prepaid Certificates, \$32.

Passenger accommodations for all classes unsurpassed. Ample attendance is provided. Every steamer carries a surgeon and stewardess.

Through tickets and through Bills of Lading issued between all prominent points.

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The American Steamship Company of Philadelphia.

Weekly Mail Steamship service between

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The following Steamers are appointed to sail from Philadelphia.

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Cabin \$75 to \$100 according to accommodations.	
Intermediate,	\$40.
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Steamers marked with a star do not carry intermediate. Passenger accommodations for all classes unsurpassed. Ample attendance is provided. Every Steamer carries a surgeon and stewardess.

These Steamers are supplied with Life-Rafts in addition to the usual Life-Boats and Life-Preservers.

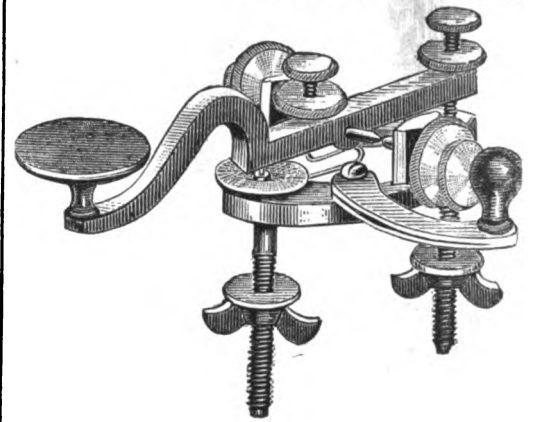
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WATTS & COMPANY,

Baltimore, Md.,



PATENT CIRCUIT-CLOSER KEY,

Does not keep line closed by binding against the anvil. Slight pressure of the finger required to put lever in circuit or cut out.

Acknowledged to be a decided Improvement.

PRICE SAME AS THE ORDINARY KEY.

Superintendents and Purchasing Agents are invited to examine our

EXTENSIVE FACILITIES

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BEST GALVANIZED WIRE,

OAK OR LOCUST SCREW PINS AND BRACKETS,

CROSS ARMS,

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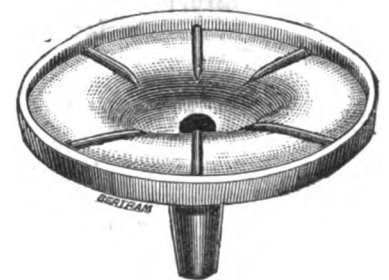
at the same prices offered by other establishments.

Our new

ILLUSTRATED CATALOGUE

contains some useful information for Superintendents and others interested in the Science of Telegraphy.

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"As near perfect as we can reasonably expect in a contrivance for this purpose."

THE BEST BATTERY INSULATOR IN USE.

OVER 4,000 FURNISHED THE WESTERN UNION TELEGRAPH COMPANY UP TO THIS TIME.

The Montreal Telegraph Company have adopted them, and have 2,500 now in use in their principal offices.

THEY THOROUGHLY INSULATE THE BATTERY,
and save more than their cost.

PRICE 40c. EACH.

Liberal reduction for large quantities.

A VERY SUPERIOR SCREW GLASS INSULATOR CHEAP.

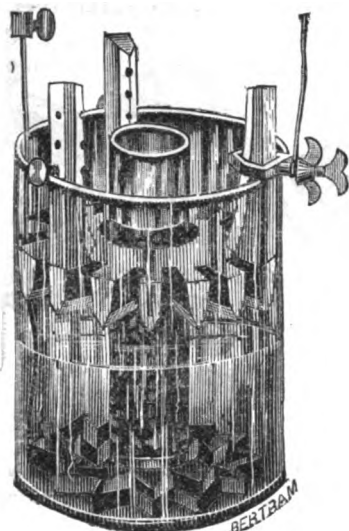
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BALTIMORE, MD.

SEND FOR CATALOGUE.

THE BALTIMORE BATTERY.



Acknowledged SUPERIOR to any other for telegraph purposes. Every comparative test made the past year resulted in the adoption of our battery.

A prominent Superintendent writes:—"My impression is the Baltimore is to be the battery of the future." He has others in circuit to determine the value of each in service.

It is now in use on *Commercial and Railroad Lines*, Stock Reporting Telegraphs, Private Lines. Superintendents Fire Alarm Telegraphs recommend it as the most reliable they have used.

Thousands furnished Gold and Stock Telegraph Co. of New York, who use no other.

For closed circuits it is without a rival.

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Manufacturers and Dealers in

Telegraph Instruments and Supplies,

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STANDARD TELEGRAPH INSTRUMENTS,

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Also Agents for Hochhausen's Superior Low-Priced Telegraph Instruments.

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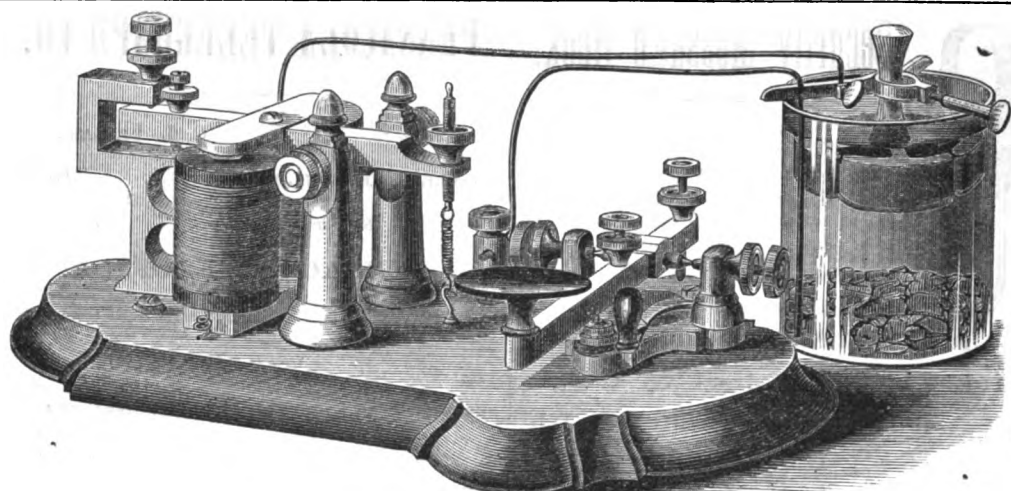
The demand for this Battery is rapidly increasing, and it is conceded by all who have used it to be the *Best and most Economical* Battery, for telegraphic and other purposes, offered to the public.

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The BATTERY which accompanies the Learners' Outfit is a full-sized Callaud, the same as the best cells used by Telegraph Companies for main battery, and gives sufficient power to produce a loud, clear sound from the instrument, the Sounder of which embodies the same remarkable principles of sound which have made our "Giant Sounders" so famous and popular among telegraphers.

The BOOK OF INSTRUCTION is a clear and practical explanation, by an experienced telegrapher, of every fact and principle of modern telegraphy and its apparatus which a student of the art could possibly require to obtain, in undertaking to become an accomplished sound operator.

PRICE OF APPARATUS complete, with Book of Instructions, Battery, Wire, and all necessary materials for one complete office outfit, ready for shipment, \$10, sent by Express, C. O. D.; or \$9.50, if money order for that amount be sent in advance. The latter plan will additionally save the purchaser the Express charges for returning money.

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Are daily in receipt of letters from all directions, pronouncing their

CHAMPION SETTS

To be just what they are named,

"Champions against all Competitors,"

And really WORTH SIX TO ONE, as serviceable and pretty instruments, more than anything of the kind yet introduced.

AGENTS WANTED.

SECOND-HAND RELAYS.

A large lot of well polished and good working Relays for sale cheap.

Also several sets of

HICKS' REPEATERS,

In perfect order, at a nominal price.

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GENERAL COMMERCIAL NEWS REPORTS,

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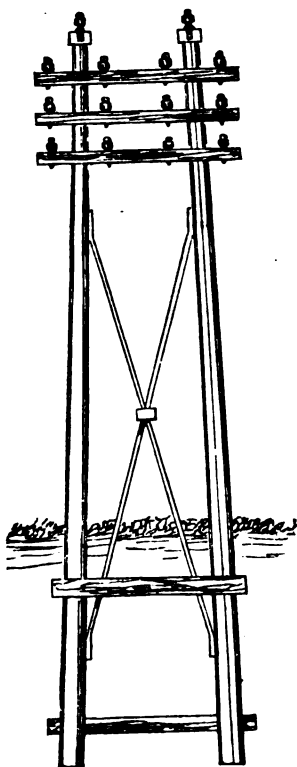
WHOLE NO. 154.

THE ENGLISH TELEGRAPHS.

By GEORGE B. PRESCOTT.

CONSTRUCTION OF THE LINES.

The construction of the English telegraph lines is uniformly excellent, and reflects great credit upon the Engineering Staff, in whose hands it is placed. As a rule, the great railway routes, where the principal lines are built, are straight and level, and free from trees, so that there are no natural obstacles in the way to prevent the construction of well-formed and symmetrical lines, and the Engineering Staff has not failed to take advantage of every opportunity to make a handsome, as well as strong and durable structure.



The timber used for poles is generally larch treated with sulphate of copper, or red fir creosoted. The following table gives the specified sizes of the red fir poles used upon the English lines:

The "light" class is generally used for lines up to seven, or even nine, wires. On railways where stays can be freely used the "light" poles are strong enough to carry more wires than the above quoted numbers. For heavily-wired road lines, and for all canal lines, where, on account of frequent and sharp curves, there is great lateral strain, the "stout" class is used. The length is, of course, determined by the number of wires, distances apart vertically and headway required under the wires. The usual height of lowest wires on road lines is, I believe, 14 to 16 feet, and when they pass over roads or field-gates 18 to

20 feet. On canals, where they are less exposed to mischievous interference, they are kept lower. The longer lengths, say 36 feet and upwards, are required for long spans or for clearing buildings, etc.

Lengths and Sizes of Red Fir Poles Used in the Post Office Telegraphs.

No. 1 SIZE—LIGHT POLES.			No. 2 SIZE—STOUT POLES.		
Length in Feet.	Minimum Diameter at Top.	Minimum Diameter at 5 ft. from Butt End.	Length in Feet.	Minimum Diameter at Top.	Minimum Diameter at 5 ft. from Butt End.
20	5 inches.	6½ inches.	22	5½ inches.	7½ inches.
22	5	6½	24	5½	8
24	5	7	26	5½	8½
26	5	7½	28	5	8½
28	5	7½	30	6	9
30	5	8	32	6½	9½
32	5½	8½	34	6½	9½
34	5½	8½	36	6½	10
36	5½	9	38	6½	10½
38	5½	9½	40	6½	10½
40	5½	9½	45	6½	11½
45	5½	10½	50	7	12½
50	6	11½	55	7½	13
			60	7½	13½

The creosoting is accomplished by the Bethel process. The poles are placed in an iron receiver and the air exhausted from them, after which boiling creosote oil is forced into them by pressure. This process greatly increases the durability of the wood, pine and spruce being thus rendered as lasting as cedar. The odor of creosoted poles in some places is said to be offensive, but no objection is raised against them in England on this account.

The following table will give the particulars as to the size and cost of the creosoted poles:

Average Length.	Class.	Diameter at Top.	Diameter at 5 feet from Bottom.	Quantity of Oil per Cubic Foot.	Original Cost of Pole.	Creosoting, Inspecting, &c.	Total Cost.
24 ft.	medium.	5	7	8 lbs.	6s.	1s. 1d. 2s. 6d.	9s. 7d.*
26 ft.	medium.	5	7½	8 lbs.	6s. 6d.	1s. 2d. 2s. 9d.	10s. 5d.*
28 ft.	stout.	5½	8½	8 lbs.	8s. 4d.	1s. 3d. 3s.	12s. 7d.+
28 ft.	stout.	6	9	8 lbs.	10s. 10d.	2s. 3d. 3s. 3d.	15s. 6d.+

The poles are never creosoted until they have been stacked a sufficient length of time to be thoroughly dry.

The cost of creosoting includes a certain margin for loading into trucks, or on board ship, which is always stipulated for when the contracts are made.

It sometimes happens that a parcel of poles are exceptionally dry, in which case they are given an extra two pounds of oil per cubic foot, costing from six pence to eight pence per pole additional.

When poles are used, which are neither prepared with sulphate of copper nor creosote, they are well seasoned, and then painted, the butt ends being slightly charred from the bottom to a foot above the ground line, and tarred.

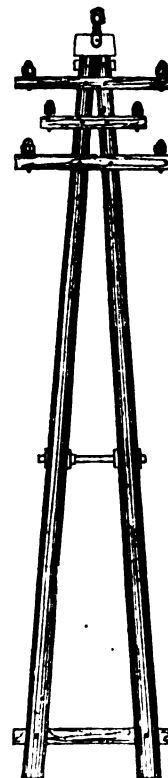
The cross-arms are made of English oak, two inches thick and twenty-four and thirty-three inches in length, and are placed alternately on either side of the pole. A twenty-four inch cross-arm is placed on the front of the pole a foot from the top, and then

* For lines carrying not more than six wires.

+ For lines carrying seven to fifteen wires.

a foot lower down a thirty-three inch cross-arm is placed on the back of the pole, and so on. In some cases as many as seventeen wires are carried upon a single line of poles of twenty-five feet in length, and no cross-arm carries more than two wires, except upon the double pole lines, where seven feet cross-arms are employed, and four wires are supported upon each cross-arm.

In the case of double pole lines, the two sets of poles are placed about three feet apart and framed together so as to support each other, seven feet cross-arms extending across and being attached to both poles at the upper end. These lines are generally to be found upon the canals, and rarely upon the railways, except near large towns where a great many wires centre. All the poles are provided with



earth wires, or contact conductors for carrying the wet weather escape directly to the earth, instead of permitting it to leak into the neighboring wires. The earth wire consists of a piece of No. 8 galvanized iron wire, extending from the top of the pole to the bottom, and terminating in a flat coil attached to the foot of the pole, so as to expose as large a surface as possible to the earth. From the thick earth wire branches, composed of No. 10 galvanized iron wire, are carried in saw-grooves sunk in the cross-arms, and soldered to the insulator bolts. This work is performed at the factory before the cross-arms are carried out on the line. The earth wires sometimes project above the tops of the poles, and serve an excellent purpose as lightning arresters.

Great care is taken to keep the poles in a rigidly

upright position, and in addition to placing them well in the ground and tamping the earth thoroughly around them, they are well supported with stays made of wire ropes attached to iron rods, which run into the ground about four feet. On straight lines and slight curves, where exposed to the wind double stays are employed.

INSULATORS.

The insulators on the railway routes are uniformly of the Varley or double cone brown ware pattern, and those upon the canals and highways of the single cone white ware, or porcelain. The Varley insulator is regarded as the best, but its greater cost has prevented its exclusive use.

THE CONDUCTORS.

The conductors employed upon the English lines are composed of zinc coated iron wire of Nos. 4, 8, and 11 gauge. The No. 8 gauge—0.170 inch diameter—is the size in general use; the No. 4 gauge—0.240 inch diameter—being employed upon a few of the long circuits between the more important points; while the No. 11—0.125 inch diameter—is used for short lines only.

The method formerly followed of allowing the wires to pass freely through the insulators, and fastening them only at distances of half a mile, has been abandoned in favor of binding them at every pole, number 16 charcoal wire being used for binding.

JOINTING THE WIRES.

Great care is observed in the jointing of the wires, which is invariably performed upon the line, no joints



by the wire makers being permitted. The joint exclusively adopted is that known as the Britannia joint. This is made by slightly bending the ends of the two wires and placing them side by side for a distance of three inches, and binding them tightly together with No. 16 wire, and soldering them thoroughly. All joints are required to be soldered whether the wires be new or old, galvanized or plain. The leading in wires at the offices are insulated with gutta percha, covered with linen tape and varnished with a preparation made of linseed oil and Stockholm tar. These wires are re-tarred from time to time to prevent decay.

THE OVER HOUSE WIRES.

The over house wires are erected in long spans, supported by iron poles attached to cast iron saddles, which are fitted to the ridge of the roof. The poles are light and well stayed by wire ropes. In London cables containing 50 insulated wires are suspended by hooks from No. 8 iron wires, carried in the manner described above. The conductors in these cables consist of No. 22 copper wire.

At Newcastle-on-Tyne a strand composed of seven steel wires, of No. 16 gauge and 454 yards long, is suspended over the Tyne, and supports a cable containing fifteen conductors. The cable rests upon ebonite chairs attached to the wire rope by means of rings placed at distances of 12 feet apart.

The overhouse wires are used principally for lines which are leased by the Post Office Department to private firms or individuals for the transmission of messages on their own special business between offices, factories, &c., and which make a system of nearly 5,000 miles.

TESTING THE WIRES.

A rough test of the insulation of the principal circuits is made every morning, and a careful test of the resistance of the insulators and conductors is made by the bridge method once a month.

The daily test is made with a tangent galvanometer, having but two ohms resistance, and consists merely in noting the deflection of the needle when connected with each circuit.

Reports of these tests are sent to the divisional engineer upon blanks prepared for the purpose. These reports give the following information: The number or name of the circuit with the length of the section tested; the deflection of the galvanometer needle; the state of the weather; the kind of galvanometer used; the number of cells in the battery employed in testing, and the constant of the galvanometer. The reduction of the galvanometer readings to ohms, and the insulation per mile is made by the Divisional Engineer. This method of testing requires but little skill or experience with the use of a galvanometer, and is performed very quickly at any office without interfering with the traffic.

The special testing reports are made once a month, and in addition to the information required by the daily tests, they give the length of open work in miles; the gutta percha work in yards; the gauge of the wire; the number and description of the instruments in circuit at the time of testing, and the resistance of the conductors as well as insulators per mile.

Although the insulators employed upon the English lines are of the most approved form and material, they do not test exceptionally high, the resistance varying from 18,000,000 ohms per mile in moderately fine weather to 150,000 ohms in damp or very foggy weather. Wires of No. 4 gauge, 800 miles in length, work well with a mileage insulating resistance of 200,000 ohms; and those of 200 miles in length are worked when the insulation is less than 100,000 ohms per mile.

All the insulators used are carefully tested at the workshops of the department in Gloucester road before they are sent out. The insulators are placed in a wooden trough made in sections and lined with lead. Each section contains an insulator placed bottom upward, the edges being covered with paraffin. The inside of the insulators and the trough are filled with acidulated water to within half an inch of the edge of the insulator. One pole of a 150 cell Daniell battery is connected to the lead lining of the trough, the other pole to one terminal of a very sensitive reflecting galvanometer; the other terminal of which is attached to a conductor with an insulating handle. The conductor is then inserted into the insulator; first into the interior and then into the crown, and if it is faulty in either part the needle will indicate it by moving.

The brown earthenware insulator is supplied by the manufacturer in separate pieces, and is put together at the works, the parts being tested separately. About two per cent. of the insulators furnished by the manufacturer are condemned by these tests and thrown out.

REMARKABLE PRODUCTION OF LIGHT IN GRINDING OF HARD STONES.—*Dr. Nöggerath.*—This note refers to a visit the author made to some agate works at Oberstein and Idar, in which various kinds of hard stones are pressed by the workmen (with their hands) against quickly revolving grindstones. The transparent stones become pervaded throughout with a yellowish-red light, like that of red-hot iron. Opaque

stones give a red light, at the place of contact, with halo and sparks. Dr. Nöggerath thinks the phenomenon worth studying by physicists, especially as regards development of heat and electricity.

RAPIDITY OF DEPOLARIZATION OF NON-CONDUCTORS.—*M. Felici.*—In his experiments the author used an electrified inducing metallic ball (insulated), a cube-shaped non-conductor, and a metallic disc connected with the earth. By a slight movement of one of two levers the ball could be connected with the earth; by movement of the other the disc could be disconnected; and they were so arranged that a descending weight moved them thus simultaneously (or with a very short interval). The non-conductor being placed between the inducing ball and induced disc, it could in this way be found how long the non-conductor retained polarization after the inducing influence ceased. The good conduction of the pieces was first ascertained; the non-conductor being absent, the disc was proved to have no electricity when the ball had been connected to the earth, and to be always electric when the connection of disc with earth was unmade before that between ball and earth was made. Then, on making the experiment with the non-conductor interposed, the effect was found exactly the same; however long the non-conductor was exposed to the inducing action of the ball, however great its polarization, there remained *no trace* of this polarization after the action ceased. A rough estimate proved the time to be 1/1000 of a second, and M. Felici concludes that this is sufficient for non-conductors to be so depolarized that no action can be perceived in them, with the finest balance.

THE INFLUENCE OF ELECTRICITY ON THE GROWTH OF PLANTS.—*M. H. Bridgman, of Norwich, England,* has lately investigated the influence of electricity on the growth of plants, and has used for this purpose a very weak galvanic battery, or rather a single element with weak acids, in order to obtain a very weak current. He takes a three-inch square glass plate, and after laying upon it two strips of sheet tin close to, but not touching each other, covers the plate with felt soaked in rain water. On the latter he spreads a thin layer of cress seeds, that had previously been well soaked in rain water. The two wires of the battery are then brought into contact with the strips of tin, and their other ends stuck through the felt. The electric current is immediately established, one half of the felt having positive, the other negative electricity. On another piece of moist felting, entirely disconnected from the battery, is placed also some cress seed in order to observe the difference in the growth of the two portions of seed. After the lapse of four days, the seed on the positive side of the first piece of felting gave signs of germination, while their hulls were shrivelling up and becoming black. On the negative side of the felting the seeds were at the same time swollen, and their hulls, which retained their natural color, were beginning to burst. In six days time the first shoots broke forth. The seeds on the second plate of felt, which were not under the influence of electricity, first sprouted many days later. The most peculiar result of this trial was, however, that while on the negative pole, where there was every sign of stronger development, the root sprout sank downward into the moist felting, on the other hand, on the positive felt the root sprouts rose upward from the blackened and dried up seeds. The upward movement of the root sprouts has already, in 1867, been observed by Blondeau; but he ascribes it to the influence of electricity in general, and not especially to the positive electricity.

ANNUAL REPORT OF THE HOLLAND TELEGRAPHS FOR THE YEAR ENDING DECEMBER 31, 1872.

I.—Lines.

Length of Lines, in miles.....	2,089
Length of Wire, in miles.....	6,991

II.—Offices.

Government.....	145
Railroad or private companies.....	187
Total.....	332
With permanent service.....	3
With full day service.....	59
With limited service.....	227
Total.....	289

III.—Apparatuses.

Morse's System.....	295
Other Systems (Hughes).....	20
Total.....	315

IV.—Personnel.

Upper Employés and Central Administration.....	18
Number of Office Employés.....	643
Subaltern Personnel.....	262
Total.....	923

V.—Messages.

<i>Interior Service—</i>	
Messages sent—Government wires.....	1,317,837
“ “ Private Companies.....	280,000
Free Messages.....	12,416
Total.....	1,610,253

<i>International Service—</i>	
Number of Messages sent abroad.....	274,728
Number of Messages received from abroad.....	310,223
Number of Messages passing in transit from one frontier to the other.....	215,885
Total.....	2,311,069

VI.—Receipts.

Product of Home Correspondence.....	\$151,493
Product of International Correspondence.....	85,253
Sundry Receipts (Transit).....	21,185
Total.....	\$257,931

VII.—Expenses.

Construction of New Lines.....	\$37,966
Expenses of operation and repairs of the Lines and Offices.....	\$375,186
Total.....	\$413,152

General Information.

Population of the State, according to census.....	3,763,104
Surface of the State in square miles.....	12,635

ANNUAL REPORT OF THE SWISS TELEGRAPHS FOR THE YEAR ENDING DECEMBER 31, 1872.

I.—Lines.

Length of Lines, in miles.....	3,538
Length of Wires, in miles.....	8,922

II.—Offices.

Government.....	690
Railroad or private companies.....	112
Total.....	741
With permanent service.....	5
With full day service.....	46
With limited service.....	690
Total.....	741

III.—Apparatuses.

Morse's.....	933
Hughes'.....	23
Translating Relays.....	23
Total.....	1,007

IV.—Personnel.

Upper Employés and Central Administration.....	16
Number of Office Employés.....	1,007
Subaltern Personnel.....	51
Total.....	1,134

V.—Messages.

Interior Service—Messages sent.....	1,480,797
-------------------------------------	-----------

International Service—

Number of Messages sent abroad.....	251,707
Number of Messages received from abroad.....	246,597
Number of Messages passing in transit from one frontier to the other.....	150,158
Total.....	2,129,210

VI.—Receipts.

Product of Home Correspondence.....	\$158,940
Product of International Correspondence.....	112,466
Product of Transit Correspondence.....	26,819
Sundry Receipts.....	20,059
Total.....	\$318,284

VII.—Expenses.

Construction of New Lines.....	\$19,000
Personnel.....	167,313
Expenses of operation and repairs of the Lines and Offices.....	194,115
Total.....	\$310,428

General Information.

Population of the State, according to census.....	2,669,065
Surface of the State in square miles.....	16,000

ANNUAL REPORT OF THE NORTH GERMAN TELEGRAPHS FOR THE YEAR ENDING DECEMBER 31, 1872.

The North German Telegraph System embraces 17,700 miles of line, 60,937 miles of wire, and 3,058 offices, of which 1,391 belong to the Government, and 1,667 to railroad and private companies. Thirty of the above named offices have a permanent service, 1,960 full day service, and 1,068 only a limited day service.

The apparatus in use embraces 3,157 Morse, principally ink writers, 88 Hughes, and 8 of other varieties, making a total of 3,253.

The number of employés is 5,569.

The number of messages sent in 1872 was as follows:

Interior.—Paid messages sent.....	6,511,375
“ Free messages sent.....	272,158
International messages sent.....	1,442,973
Transit.....	254,739
International messages received.....	1,554,079
“ service messages sent.....	21,718
Total.....	10,158,041

Receipts.

From Interior messages.....	\$1,217,414
“ International messages.....	1,020,973
“ Sunday receipts.....	23,852
Total.....	\$2,262,239

Expenses.

Construction.....	\$306,530
Ordinary expenses.....	1,556,459
Repairs of lines.....	650,813
Total.....	\$2,513,802

INDIA-RUBBER, GUTTA PERCHA, AND TELEGRAPH

WORKS.—The Directors state that the net result of the year's trading showed a credit balance of only £9,090 to be transferred to profit and loss account, which, with the amount, £32,500, brought forward from the year 1872, made a total of £41,590. The general business of the Company had been fairly remunerative, but the very heavy expenses incurred in their persevering, and at length successful, efforts to pick up and repair the Colon and Jamaica cable, had absorbed a very large proportion of their profits. The suit in Chancery brought against the Company by the West India and Panama Company was still pending. Under existing circumstances the Directors could not recommend that any dividend should be declared, and they, on their part, had agreed to renounce their personal remuneration for the year 1873. The Colon cable was for the time being in operation for the benefit of the Company. It was ten-

dered by them to the West India Company unfettered by any condition, though up to the present moment they had not taken possession. They had been in treaty during the year for several cable contracts, and they had dispatched a special agent to South America in order to obtain concessions for cables along the Pacific coast. He had arranged matters satisfactorily with the Peruvian Government, and had gone to Valparaiso. The steamship Dacia would proceed next week to lay a short cable between Marseilles and Barcelona, and the International was now on her homeward passage from New York, having finished, to the entire satisfaction of the United States Government, the Torpedo cable contract.

INDO-EUROPEAN TELEGRAPH COMPANY.

The seventh ordinary general meeting of this Company was held Feb. 27 at the City Terminus Hotel, Col. James Holland in the chair.

The Directors' report, after stating their regret at the retirement from the direction of the Hon. Mr. Grimston, through a severe accident, submitted the accounts for the year 1873. From these the receipts appeared as £54,897, showing an increase of £17,817 over those of the previous year. The expenditure on commercial account amounted in the twelve months to £18,793, or £5 more than in the year 1872. Agents had been appointed at Bombay, Calcutta, Madras, and Singapore, and arrangements were being made for having agents at Hong Kong and Shanghai. The Directors reported the effecting of a modification of Messrs. Siemens' maintenance contract with the Company, by which, in lieu of a fixed payment of £34,000 per annum, the amount payable would be £24,000, Messrs. Siemens becoming entitled to 26 per cent. of the net earnings after the shareholders had received a dividend of 3 per cent. Thus the former amount of £34,000 could not be received by the contractors until 10 per cent. had been paid to the shareholders. The balance of the revenue account, after deduction of the claim for wire rental of £12,000 retained by the British Post-Office, but disputed by the Company, of £24,000 payable to Messrs. Siemens, and of the general expenses, amounted to £5,119. Of this sum £3,888 had to be set aside for the liquidation of the Persian debt, which would leave a balance of £1,230 to be carried forward to the credit of the current year. The Post-Office retaining the above mentioned £12,000, no sum was left available for dividend; but the report added that the Company's appeal against this payment, in respect of which Mr. Scudamore gave his opinion that they were entitled to relief, was still before the Treasury. The line was in a satisfactory condition, though interruptions in some sections not belonging to this Company had taken place, and there had been severe electrical storms. In their endeavors to introduce a word rate, the Board had been but partially successful, and the system could not be introduced on the Continent of Europe. The Imperial Russian Government had granted an extension of its concession for ten years, and the Board had agreed to erect, for the use of the Russian Government at a toll, a wire from Kerch to Ekaterinodar, and the erection of another wire between Djulfa and Tiflis was under negotiation. The Directors also stated that they were in treaty with the Persian Government, and for a joint purse with the Eastern Telegraph Company, the last of which had given rise to differences between the Board and Messrs. Siemens. But the report expressed the opinion of the Directors that an agreement with the Eastern Company of the general character of that already made known to the shareholders, with certain modifications, was most desirable.

CORRESPONDENCE.

A SUGGESTION.

SYRACUSE, N. Y., March, 17.

To the Editor of the Journal of the Telegraph:

In all large commercial offices do away with the sounder and local battery altogether, substituting a uniform sharp-sounding relay magnet of as low resistance as possible. Carpet the floors, and make a rule prohibiting unnecessary noise. Where lines are well insulated this can also be carried out in small offices. The saving would be immense, and with no detriment to the service. W. H. PARSONS.

GREENCASTLE, Ind., March 6, 1874.

To the Editor of the Journal of the Telegraph:

In my experience with Error Sheets, I observe that a goodly number of errors occur by changing of checks in transmission. To remedy this, I would suggest that the amount of tariff be added to the check. This would act as a guard against change. I wish to make a few more suggestions:

- 1st. That each office be supplied with a good map.
- 2d. That offices be supplied with half-rate message envelopes printed with red ink, and the words "Half rate" in a conspicuous place.
- 3d. That commercial offices be supplied with letter-heads.
- 4th. That a space one inch wide be made in next Tariff Book at the left of "Square Column," with "JOURNAL No." at the top, to be used for writing the No. of JOURNAL in case of change, for reference. I keep mine that way as it is, but would like more space for that purpose. G. C.

DYER, Ind., March 14, 1874.

To the Editor of the Journal of the Telegraph:

A communication in JOURNAL of March 2d, from C. D. S., who gives his experience in Error Sheets, says he finds the larger portion of discrepancies are within the radii of the air-line rates. I have had considerable experience in the "Error Sheet" business myself for same cause. I should suggest that all offices be supplied with a map giving circles within radii of 25 and 50 miles. J. I. M.

LOCKPORT, N. Y., March 19, 1874.

To the Editor of the Journal of the Telegraph:

The suggestion of "S." in your last issue relative to having an extra column in the Registers used, headed "Total," in my opinion is a good one, and I would be pleased to see it carried out. It would be the means of avoiding many errors in footing up totals for offices, and of posting into ledgers.

I notice a great many bookkeepers and managers also waste much of their Registers. For instance, a day's business may not consume a whole page, leaving half or a quarter of a page blank; they turn over and begin a new page for the next day's business—also leave a space of two lines between offices, whereas one is sufficient. By putting the footings in red ink with our present books a great many errors might be avoided. G.

LITCHFIELD, Ill., March 16, 1874.

To the Editor of the Journal of the Telegraph:

A communication in the JOURNAL of February 16th, from M. M. Darr, of Venice, Ill., in regard to an operator knowing whether the line is working when the instrument is not adjusted, I find that by taking a common steel pen and pin, and attaching the pin to the back or front set screw of relay, that when the line is working the pin will be in motion; when closed it will point to magnet—when open will hang straight in any kind of weather.

J. E. MORRIS.

AN ARITHMETICAL PROBLEM.

To the Editor of the Journal of the Telegraph:

Will you, or some of the readers of the JOURNAL, please inform me through the JOURNAL how I can place the following figures: 1, 2, 3, 4, 5, 6, 7, 8, 9, so that by adding them together they will make just 100? But none of the figures are to be used twice. M. J. STONER.

To the Editor of the Journal of the Telegraph:

Would it not be well for offices corresponding with Waterford, New York, and Waterford, New Jersey, to write the name of the State in full? I frequently receive letters from the above named places. WATERFORD, PA.

UPPER SANDUSKY, Ohio, March 22, 1874.

To the Editor of the Journal of the Telegraph:

The JOURNAL of March 15th contains an article directed to managers of railroad offices, instructing them to practice more care in regard to keeping the business private. This hits me exactly, and it is a matter that has annoyed me a great deal. Our office and the railroad agent's office are both in the same room, and there is no construction to keep outside parties from this room. Consequently, at all times some one is in the office that should not be. I am also clerk for the agent. Frequently I am called from his desk to answer a call when I am waiting on a customer, and ten chances to one he will follow me to the instruments and look over my shoulder. If this is not an imposition I should like to know what is; and the question arises, how is it to be avoided? We can do nothing. The majority of railroad telegraph offices are situated in a similar way. I suggest that something be done to prevent such impositions on managers of offices that are connected with railroad stations.

J. A. BENNETT, Manager.

OXFORD, Ala., March 20, 1874.

To the Editor of the Journal of the Telegraph:

Allow me to make a suggestion. In sending either full or half rate messages which are to be repeated, would it not be well to include the amount paid or to be collected in the check. It would certainly obviate the necessity for sending forth so many error sheets from District Superintendent's office. To illustrate. In the month of October, '73, I forwarded a message, containing 30 words, from Childersburg, Ala., to Hernando, Mississippi—tariff, 75 and 5. It was a paid message, but the amount was not included in the check. A few days since I received error sheet, and therein found that Hernando had checked me \$4.55 on the message. A most egregious mistake, truly, was it not? Your comments would be very acceptable.

C. D. THOMPSON.

To the Editor of the Journal of the Telegraph:

What is half rate tariff for 15 words from N. O. to Brooklyn, N. Y. JOURNAL says check Brooklyn direct. If so, should not our tariff be 215 and 14. We have been checking Brooklyn at 15 and 1 from New York City on half rate messages, which would make tariff on 15 words 133 to N. Y. City, and 20 cents (full rate) from N. Y. city to Brooklyn, a total of \$1.53. I contend tariff should be \$1.43, half of \$2.85 direct tariff. Please answer in your next issue. NEW ORLEANS.

Answer.—The rate from New Orleans to Brooklyn is \$2.15 and 14. Fifteen words amount to \$2.85. One-half of this amount (\$1.43) is the proper charge for a half rate message of fifteen words between those points.

YORK, Me., March 16, 1874.

To the Editor of the Journal of the Telegraph:

Suppose I send a D. H. message for myself, and make ck. "10 D. H., no account, Manager," has the receiving operator the right to say "Can't receive it so?"

Is, or not, the receiving operator at any office bound to take a message as it leaves the Manager?

Is, or not, the Manager supposed to be competent to have the message in proper shape for sending?

Or, is the manipulator at the key of the receiving office the proper person to judge and dictate to a manager at the sending office?

I never owned nor possessed a dictionary, nor studied a word of grammar, but I claimed that "meeting-houses" is one word, Boston and Portland both claimed it was two. Which of us was

RIGHT?

Answer.—The check to your message was an improper one. Account must be made of every free message which is transmitted. The receiving operator was right in requiring you to conform to a rule which was manifestly being violated. According to Webster meeting-house is one word.

To the Editor of the Journal of the Telegraph:

I wish to have you answer two or three questions, through the JOURNAL:

First.—If I receive a message on the 19th dated the 18th, how shall I book it? As a part of the business for the 18th or of the 19th?

Second.—How many words in the following: "Will expect you the last of week. Richard about the same. Hope Eddie's better?" I claim that there are fifteen. Detroit would not take it unless I made it fourteen, or spelled "Eddie's" out. Eddie is—I claim that Eddie's is the same as two words?

Third.—Between what hours may red messages be taken in, and transmitted? As I understand it, a red message may be taken in at any time during the day, to be sent after full rate business is out of the way. Now, has a man any right to come in the office in the morning, date a red message the day before, and have it sent as such? I know of an instance where a man sent a red message on Monday morning, and dated it the Saturday preceding.

Fourth.—Has an operator any right to change the date of a message when he has reason to suppose the sender made a mistake in dating his message?

Fifth.—Is the following one or two messages: To "H. S. Sutherland or Albert Sutherland."

"Meet me to-morrow."

"(Signed)

"SENTINEL."

Answer—First.—The message should be booked with the business of the 18th.

Second.—There are fourteen words. It should not be assumed that a word means anything else than it expresses.

Third.—Half rate business may be taken at any time during the day to be sent in the evening. A customer has the right to date his message as he pleases, but if it is not the correct date he should be charged for the extra words.

Fourth.—An operator should in no manner alter a message.

Fifth.—One message only, but the three last words in the address should be charged for.

To the Editor of the Journal of the Telegraph:

Please explain in JOURNAL how, in working Hughes Printer with Duplex, the operators break without confusion in the printed matter? G. W. H.

Answer.—The operator would not break unless confusion already existed.

BURLINGTON, Iowa, March 5, 1874.

To the Editor of the Journal of the Telegraph:

Supposing a message is handed in signed "Smith & Jones," and the receiving clerk has reason to believe that the names "Smith & Jones" are not the name of a firm, but those of two individuals interested in the subject-matter contained in the telegram, should the clerk consider "Smith & Jones" a legitimate signature, or should it be treated as containing two extra words and charged for? EDGAR.

Answer.—The signature as given is a proper one and should be received. Nothing should be questioned in a message which conforms with the rules of the Company.

To the Editor of the Journal of the Telegraph:

Insulators are frequently broken by school boys and the line grounded; trees are thrown on line very often without care as to damage done, or fear of punishment, but in every instance it is a expense, and an interruption to business. What is the law with regard to this, or is there any law for its protection? Please answer and oblige a young operator and repairman. I have threatened offenders with the law from time to time without knowing if there was any law for its protection. J. J. C.

Answer.—In most of the States there are special laws for the protection of telegraph property. If such laws do not exist in your State protection is afforded by the common law. The facts should be reported to your superintendent.

S. F.—Covers for the JOURNAL are not furnished by the Company.

W. B. B.—There are fourteen words in "S. S. Peacock will arrive four thirty P. M. or seven forty-five A. M., to-morrow."

Mason.—There are nine words in "Give Foyle check on New York for Hunt on us."

Wag.—There are twenty-five words in "Know nothing of your box. Received nothing from S. & I. S. E. R. R. but one cook stove which I forwarded on the fourth instant."

F. D.—Munson's work on Stenography would be good to commence with. Any bookseller can procure it for you.

J. H. A.—We cannot inform you as to the amount of business transmitted during the first, second and third days of the establishment of the Morse system of telegraph. Nor can we even approximate the amount of one day's earnings at this date.

THE PHENOMENA OF INDUCED CURRENTS.—The induction current is very generally employed, as is well known, in the stimulation of nerves and muscles. A new fact in this connection has been pointed out by Mr. Onimus, and is worth noting by physiologists. It is that the physiological effects differ according to the material of which the wire is formed. He made exactly similar coils of copper, lead and German silver wire, of 210 metres in length, and of equal diameter. They were submitted in the same way to the action of the inducing current. It is stated generally that when the wire for the induced current is of a metal that conducts electricity badly the contractions are much stronger, and the impressions on the cutaneous nerves less vivid than with good conducting wires, such as copper. The current induced in the badly conducting wires has much greater tension than that in good conductors. Various experiments are described which appear to show that German silver may with advantage be substituted for copper wires in certain cases.—*English Mechanic.*

LONDON, Jan. 17, 1874.

To the Editor of the Journal of the Telegraph:

The writer of the article in the Birmingham Post, quoted in your JOURNAL, has not quite accurately stated the facts of the transmission of Bright's speech, and therefore gives a wrong impression of "How Telegraphing is done in Britain."

Unfortunately, our work on such occasions does not consist in repeating one authentic report on several circuits, but in transmitting whatever the agents of the several newspapers choose to send us. On the night in question as many as eleven (11) distinct reports of varying length were sent; and as the copy came in very irregularly much care and time, as well as many wires and hands, were required to keep each distinct.

If but one report had to be dealt with we should run the punched paper through the transmitting machines one after the other, and the saving of time and trouble by using the automatic system would be enormous.

1. The work actually done was not 120,000, but 160,000 words.

2. We did not use 48 machines, but 11 (eleven) automatics and 9 keys. The key circuits were used for the shorter reports and for repetitions, so as not to stop the automatic machines when a "way" station happened to lose a few words.

3. The number of operators was 20; the punchers, 15 to 18 for 3 hours; fewer afterwards.

The number of perforating or punching machines was 18.

4. Full work did not commence before 9:15, as till then the supply of "copy" from the reporters was very irregular and scant.

The bulk of the work was done by 1 A. M., many wires being clear by midnight. The very last word was sent by 2 A. M., and this on a faulty wire.

5. The speech was sent automatically to 17 towns, including what you call "drop copies," namely, on—2 circuits to London direct.

- | | |
|--|--|
| 1 " " Glasgow | |
| 1 " " Liverpool and Glasgow. | |
| 1 " " Liverpool and Hull. | |
| 1 " " Dublin and Belfast. | |
| 1 " " Newcastle and Edinburgh. | |
| 1 " " Darlington, Newcastle, Edinburgh and Dundee. | |
| 1 " " Sheffield, Leeds and Bradford. | |
| 1 " " Manchester and Leeds. | |
| 1 " " Bristol, Exeter and Plymouth. | |

The key circuits were:

- | | |
|----------------|------------------|
| 4 to London, | 1 to Manchester, |
| 1 " Dublin, | 1 " Cardiff, |
| 1 " Sheffield, | 1 " Bristol. |
| 1 " Leeds, | |

We have no record of the work done on any individual wire except that to Manchester and Leeds. On this, 55,000 letters were sent between 8:30 and 11:30—in three hours, including many stoppages for copy during the first three-quarters of an hour. Now this gives 305 letters a minute without deducting the stoppages, and the work was delivered to the press within three hours after the first slip of copy had been handed to us.

The President's speech was sent, it is said, from Washington to New York in 22½ minutes, but you say in the JOURNAL it was not sent out from the office till 4½ hours after the copy was received, and the number of words was 11,500, only 500 more than our three hours' work. And, moreover, ours was not a case of one single operation, on which all the force of the staff could be concentrated. A great excess of precaution was observed, both as regards spare apparatus and extra staff. The Post wished to

show what enormous energy our department displayed, and made the largest figures the case would admit. Of course the collating and keeping distinct our eleven dispatches required several hands, as, also, the receiving at the other end of the wire.

As many of the newspapers have to be ready for the 2 A. M. trains, and as the Manchester and Leeds papers go to press at 12:30, very little time is given us for the transmission. Beside this, we had to find wires for 17 stations, lying in different directions, so that we could not use many wires to any one place.

We could have kept up a speed of 35 words a minute with the key, but we wanted a speed of 61 words, on a single wire.

Had I known you would have honored us with a mention of this case, I might possibly have obtained further details. But these cases are not very few or far between with us, and are becoming more frequent month by month.

Yours faithfully,
R. S. CULLEY.

FEBRUARY 17, 1874.

You wish to know relative to the transmission of Mr. Bright's speech, "how many words were contained in each of the eleven distinct reports handed in, and the total number in all."

I regret that I cannot give you the number of words sent on each circuit, as unfortunately no record exists, but on one circuit—the Manchester and Leeds—over 11,000 words were transmitted between 8:30 and 11:30 P. M., including several stoppages waiting for matter.

The total number of words forwarded amounted to 160,034 words.

I am much obliged to you for the information respecting the transmission of the President's message. I remain, yours faithfully,

R. S. CULLEY.

This much is certain. We have operators, and could have sent them to Birmingham, who can send as fast as yours; and had they been sent, and had we trusted to sounder or Morse, we could not have got the work off in the time.

CURE OF RHEUMATISM IN A HORSE BY ELECTRICITY.—G. D. Powell, M. D., in the *Irish Farmer's Gazette*, describes the cure of a valuable horse by means of electro-puncture needles, from four to six being inserted in the principal muscles of the fore-quarters, also along the spine and hind-quarters. The battery employed was that of Leclanché, from four to twelve large cells, alternating in strength, and the current broken, causing the muscles to contract perceptibly. This was kept up from two to three minutes at each place. Prior to treatment, the animal was in so bad a condition that the owner was about to cause him to be shot. But within about six weeks after the commencement of the electrical treatment, the horse was perfectly restored, and is now sound and useful.

A LEAD AND ZINC BATTERY.—A new form of galvanic battery, invented by Pierlot, is thus described in *Comptes Rendus*: In a suitable glass or earthenware vessel is placed about a pound of chloride of lead, into which is inserted a plate of lead with a varnished lead wire attached. In the other part of the vessel is inserted an amalgamated zinc plate, about nine millimeters thick, covered with a bag of parchment paper. Every two or three months water is added. The current is said to be strong and constant.

MACHINERY does not do away with the necessity for labor: it merely changes its character. It demands brains rather than muscle.

TARIFF BUREAU. SEMI-MONTHLY CIRCULAR.

EXECUTIVE OFFICE,
WESTERN UNION TELEGRAPH COMPANY,
145 BROADWAY, NEW YORK.
April 1, 1874.

To all Offices on W. U. Lines:

The following changes and additions have been made since the date of the last circular:

GENERAL INFORMATION.

STATE RATES.—The following changes in State Rates should be observed:

From Illinois and Wisconsin to Cape Breton Island... \$2 00
From Kansas and Nebraska to Delaware. 3 00

Letohatchie and Loachapoka, Ala., re-opened.

Lincoln, Cal., re-opened.

Wheatland, Cal., is now a W. U. office.

The P. O. A. address of Boston, Ky., is *Boston Station, Pendleton County.*

Neponset, Mass., re-opened.

Norton, Mass., closed.

West Newton, Mass., re-opened.

St. Helens and Wells, Mich., closed.

The P. O. A. of Riegelsville, N. J., is *Musconetcong.*

Lebanon, N. J., re-opened; square 52.

Mott Haven, N. Y., is now a W. U. office; square 41, check direct.

The P. O. A. of Skaneateles Junction, N. Y., is *Hartlot, Onondago Co.* (Second Notice.)

Forestville, N. C., closed.

Hereafter the "tariff for other lines to Mantua, W. Phila. (printed under head of Phila.), will be 25 and 1 instead of 10 and 1.

The P. O. A. of Shenango, Pa., is Shenango, Greenville P. O. Roaring Branch, Pa., closed.

Messages may be taken for Riegelsville, Bucks Co. Pa., and delivered from Riegelsville, N. J.

The following is a revised list of offices in Texas, on the Texas and Pacific R. R. line, with "tariff for other lines."

<i>The rate for additional words is the same as that on W. U. Lines.</i>	Marshall, Texas.	Sherman, Texas.	Dallas, Texas.	Texas, Ark.
Atlanta.....	50	75	—	50
Bonham, (re-opened).....	85	50	—	75
Brookston.....	75	65	—	65
Clarksville, Red River Co.....	65	65	—	65
Forney.....	75	—	50	—
Gladewater.....	50	—	75	—
Grand Saline.....	65	—	65	—
Honey Grove.....	85	50	—	75
Hawkins.....	50	—	65	—
Lanark.....	50	75	—	50
Mesquite (new office) ..	75	—	50	—
Moore's Landing.....	65	75	—	50
Paris.....	75	65	—	65
Savoy (new office).....	85	50	—	75
Terrils.....	65	—	50	—
Wellspring.....	65	—	50	—

Messages addressed to Port Washington, Wis., should be sent and checked in the same manner as Ozaukee business. Ft. Washington is another name for Ozaukee.

NEW OFFICES.

* Bluff Springs, Fla. 100 10 305 Pollard, Ark.
465 Hamlin, Ka.
148 Sterling, Mich.
369 Traverse Road, Mich.
418 Bedford, Mo.
110 Mumford, N. Y.
115 Wakeforest, N. C.
5 Berwick, N. S.
3 Shubenacadie, N. S.
221 Burgoon, O.
* Nicetown, Phila., Pa. 75 1 59 Philadelphia.
486 Marquez, Texas.
490 Rockdale, Texas.

* Scott, W. Va. { 40 3 182 Huntington.
65 4 133 Greenbrier, W. S. Spgs.

OFFICES HAVING "SHEET C."

Erase Menominee, Mich., from your "Sheet C."

WILLIAM ORTON,
President.

EXECUTIVE ORDER No. 156.

EXECUTIVE OFFICE,
WESTERN UNION TELEGRAPH CO.,
New York, March 30, 1874.

The complimentary franks of 1873 are hereby continued in force until the 1st day of May, 1874.

GEO. H. MUMFORD,
Vice-President.

TRANSFER SERVICE.

EXECUTIVE OFFICE,
New York, March 23, 1874.

On April 6th, Kit Carson, Colorado, will be discontinued as a money order office.

GEO. H. MUMFORD,
Vice-President.

EXECUTIVE OFFICE,
New York, March 27, 1874.

On and after April 6th, 1874, Hartford, Ct., and Providence, R. I., will be added to the list of offices specially authorized.

GEO. H. MUMFORD,
Vice-President.

The headquarters of Mr. C. H. Foster, Superintendent of Telegraph, Indianapolis, Bloomington and Western Railway, has been removed from Urbana, Ill., to Indianapolis, Ind. Hereafter all communications should be addressed to him at the latter place.

THE TELEGRAPHERS' MUTUAL BENEFIT ASSOCIATION.

ASSESSMENTS NOS. 58, 59 AND 60, ISSUED MARCH 24, 1874.

DEATH OF W. H. KELTY, C. P. ROSSER AND SAMUEL PORTER.

Announcement is made of the death, during the past month, of three members of the Association. Messrs. Kelty and Porter were among the first members. These frequent deaths may seem to impose a heavy burden on many members, but they also show the need of the Association. Let all be as prompt with their remittances as possible. These deaths necessitate the issuance of another triple assessment.

Assessment No. 58.—W. H. Kelty (certificate No. 261), died Feb. 8th, 1874, at Titusville, Pa., from injuries received by being thrown from a sleigh.

Assessment No. 59.—Chas. P. Rosser (certificate No. 1,648, issued Sept. 24, 1872), died Feb. 11, 1874, at Maysville, Ky., from the effects of an over dose of an opiate.

Assessment No. 60.—Samuel Porter (certificate No. 311, issued Sept., 1868), died Feb. 22, 1874, at Albion, N. Y., of pneumonia.

Members holding certificates numbered up to and including No. 2,194 will please remit for above assessments.

The following circular to the members has been issued:

"The testimony in favor of dropping the second initiation fee has been so nearly unanimous that the Executive Committee have determined to accept delinquents without its payment. The first initiation fee was, in point of fact, only fifty cents, the dollar going as a payment of the following assessment. The second fee was, therefore, practically, three times as much as the first, as no part of it was accredited on assessments. We hope the effect of

this action may be to restore many valuable members to the Association.

JAMES D. REID, Treas."

ACKNOWLEDGMENT OF RECEIPTS FOR ASSESSMENTS NOS. 55, 56 AND 57, UP TO AND INCLUDING MARCH 23, 1874.

2, 4, 6, 8, 13, 23, 46, 54, 58, 61, 67, 70, 72, 75, 76, 78, 80, 82, 89, 93, 97, 99, 103, 114, 130, 131, 132, 131, 134, 143, 146, 148, 175, 176, 177, 178, 183, 188, 189, 190, 191, 193, 197, 198, 201, 202, 213, 218, 240, 244, 247, 255, 257, 278, 279, 281, 282, 283, 285, 289, 346, 350, 353, 361, 367, 372, 378, 392, 398, 403, 405, 406, 413, 414, 425, 435, 456, 463, 464, 474, 476, 478, 484, 511, 512, 530, 533, 542, 543, 552, 553, 554, 567, 569, 574, 577, 590, 594, 600, 604, 622, 643, 646, 659, 660, 662, 663, 664, 665, 669, 678, 680, 685, 714, 729, 731, 735, 764, 772, 797, 803, 806, 813, 815, 830, 830, 848, 853, 859, 870, 883, 886, 901, 905, 911, 912, 922, 927, 938, 939, 941, 942, 952, 978, 991, 992, 995, 998, 1005, 1011, 1013, 1047, 1055, 1058, 1073, 1074, 1075, 1076, 1085, 1093, 1100, 1101, 1102, 1127, 1143, 1149, 1152, 1155, 1156, 1157, 1159, 1160, 1162, 1164, 1185, 1196, 1303, 1313, 1324, 1337, 1338, 1343, 1351, 1353, 1354, 1367, 1370, 1376, 1377, 1383, 1387, 1398, 1399, 1394, 1394, 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2560

TELEGRAPH CONSTRUCTION AND MAINTENANCE COMPANY.

The report states that the accounts for the year show a net profit of £118,694, to which is added £12,715, brought from last year's account, making a total divisible profit of £131,409; of this £22,410 has been appropriated to the payment of an interim dividend of 5 per cent. on the capital of the Company, leaving £108,999 to be dealt with. Of this sum the Directors propose to distribute as dividend £89,640, being at the rate of £2 8s. for the past year per share, or 20 per cent., and making, with the amount already paid, a total dividend of 25 per cent., free of income-tax; the balance, £19,359, being carried forward to next year's account. During the year 1873 the following works have been carried out: The laying of a cable for the Anglo-American Company between Valentia and Heart's Content, Newfoundland, and two cables between Placentia and Sidney, Cape Breton, a total length of 2,470 nautical miles, and both sections of the French Atlantic Cable of 1869 have been successfully repaired. A duplicate cable for the Eastern Telegraph Company was laid during the Summer between Lisbon and Falmouth, touching at Vigo (866 nautical miles), and the first section of the Brazilian cable (625 nautical miles) was submerged between Lisbon and Madeira, but in consequence of a fault having subsequently developed itself, the cable had to be broken in deep water to remove the fault; and, owing to the lateness of the season, and unusually tempestuous weather having set in, the repair had to be abandoned until the Spring of 1874. In fulfillment of a contract entered into some time since with the Eastern Telegraph Company, this Company, assisted by Mr. W. T. Henley of North Woolwich, have laid in the Levant 785 miles of cable, forming another connection between Italy and Egypt, *via* Zante and Candia. The West India and Panama Telegraph Company having applied to this Company to put certain of their cables into working condition, and to lay a new cable between Jamaica and Panama (subsequently changed, so as to connect Jamaica with Porto Rico), the work was undertaken and satisfactorily completed early in the present year.

The total length of all cables laid during the past year amounts to 4,701 nautical miles. The manufacture of the second and third sections of the Brazilian cable has been so far completed that the operation of submerging them will be forthwith commenced, and it is expected to complete that contract by the middle of this year. Your Directors have also to report that a contract has just been concluded with the Anglo-American Telegraph Company for the manufacture of 1,100 nautical miles of cable, and for laying the same, together with 900 miles surplus cable belonging to that Company, between Ireland and Newfoundland, during the current year. The Company has taken steps for extending the system of submarine telegraphy along the West Coast of South America, where a valuable traffic awaits its completion; in furtherance of this object an exclusive concession has been secured from the Peruvian Government, and within eighteen months your Directors hope to have laid a cable connecting Peru with Panama. The Tasmanian cable has been transferred to the Eastern Extension Telegraph Company, and now forms a part of its system. The Company's works have still further improved and enlarged, and various measures have been adopted to increase its resources, and the means of rapidly and economically executing further contracts. After seven years devoted to the interest of the Company, Rear-Admiral Sherard Osborn has been obliged to

resign the post of Managing Director. The Board has appointed as his successor Rear-Admiral Richards, C. B., F. R. S., late hydrographer to the Navy. Under the management of Rear-Admiral Osborn, the Company has enjoyed great prosperity, and achieved a reputation which has contributed in no small degree to the development and stability of submarine telegraphy. The Board desires to place on record their appreciation of their colleague's tact, skill and judgment in dealing with complicated negotiations and enterprises of a very difficult nature, and are glad to feel they will still have his service as a Director.

SUBMARINE TELEGRAPH.

The half-yearly meeting was held at the London Tavern on Tuesday, Feb. 24, Sir J. Carmichael in the chair.

The report stated that, in comparing the half-yearly accounts with those of the corresponding period of 1872, there was a reduction of £341 in the receipts. The underground line on the French coast, in connection with the Calais cable, had been renewed, as the wires were in such a faulty condition as to render any further expenditure on repairs inexpedient. The Directors were of opinion that the cost of this new line might properly be charged to the reserve fund, to be divided proportionately between the French and Chartered Companies. The net profit for the six months ending the 31st of December, 1873, enabled the Directors to add 5 per cent. of the gross receipts to the reserve fund, and to recommend a dividend at the rate of 16½ per cent. per annum. The Directors anticipated that the steady development of traffic during the current year would more than compensate for the slight reduction in the receipts which had occurred in the settlement of accounts with the Post-Office.

THE BRITISH AND NORTH AMERICAN TELEGRAPH.

Last week we directed attention to the discreditable disclosures which had been made in the proceedings for winding-up this Company, which, like so many others, was formed to supply what is popularly called "the public want" of direct telegraphic communication with America. The case was again before the Vice-Chancellor last Saturday. When this Company was brought out, only 2,299 shares out of a total of 80,000 were allotted to the public. Notwithstanding this failure on the part of the public to respond to the appeal made to them, the Directors got up a number of "bogus" applications for shares, in order, as the Vice-Chancellor said, "to impose upon the Committee of the Stock Exchange, and induce it to grant a settling day for the Company."

We commend the following observations of the Vice-Chancellor to the serious notice of promoters and concoctors of unsuccessful companies:

"This scheme was of a most reprehensible character, and was one in which the Court of Exchequer, in the case of the 'British and American Telegraph Company v. The Albion Bank' (L. R. 7, Exchequer 119), had already decided made the parties to it amenable to the criminal law. However, the Directors went on, shares were allotted, and in November, 1867, the Company was ordered to be wound up, and his Honor was now asked to dismiss this bill on the ground that these proceedings had not, in fact, resulted in any loss to the Company. There had been, however, six years of litigation, over £7,000 of costs, and great vexation to the shareholders, who had paid up £18,000; all this had resulted from the proceedings of these gentlemen, one of whom

was a retired judge, another a banker, another a retired chaplain in the navy, and the other an architect and engineer. It was extraordinary that such a body of gentlemen could have been induced to enter into the transaction which led to all this—a transaction which he could not find words strong enough to condemn. He was, however, asked to dismiss the bill against them. Now, two days ago he had asked these gentlemen, who, apart from these considerations, were men of high consideration, whether they were willing to make good the loss which they had occasioned to the shareholders. Nothing less than that could do justice to the persons who had suffered by this ridiculous and nefarious scheme. This he still considered these gentlemen ought to do; he should, however, endeavor to see if the law in its present state could not compel them to do that which they ought to do, and if his suggestion were not acted upon within a week he should proceed to deliver his final judgment at as early a date as possible.—*Railway News*, Feb. 28.

ADVICES from Yokohama, Japan, dated Feb. 23, state that the work of constructing a telegraph line northward is progressing favorably.

NEW GRENADA shortly will have completed 969 miles of telegraph, extending from Port Buenaventura, in the Pacific, to Cucutaneas, on the borders of Lake Maracabo.

THE West India and Panama Telegraph Company have received intelligence, through their engineer, Sir Samuel Canning, of the complete restoration of the section of their cable between Martinique and Dominica, thus reopening for traffic the whole of the lines from Cuba to Demerara. The interruption on the Cuba Company's cable is now the only obstacle to direct telegraphic communication with the West Indies, and it is hoped that this cable will be completed shortly.

THE traffic receipts of the Great Northern Telegraph Company for the month of February last amounted to 288,094s., and in the corresponding period of 1873 to 189,095s. On the European lines the receipts for February amounted to 173,235s., and in 1873 to 109,415s.; and on the China and Japan lines for February to 114,859s., and in 1873 to 79,680s.

THE screw steamer Gomos, having on board 593 knots of telegraph cable, left the Thames on Thursday, 5th ult., for Rio de Janeiro. The cable forms the remaining portion of that contracted for by Messrs. Siemens Brothers for the Platino-Brazilera Telegraph Company to connect Rio de Janeiro with Uruguay, the first part having left England a fortnight ago in the steamer Ambassador.

THE total number of messages forwarded from postal telegraph stations in the United Kingdom during the week ended the 28th of February, 1874, and during the corresponding week of 1873, were respectively: Week ended February 28, 1874—total number of messages, 329,245; week ended March 1, 1873—total number of messages, 301,131. Increase in the week of 1874 on that of 1873, 28,114.

THE steamship Great Eastern will start in August to lay the Portuguese telegraph cable from St. Vincent, in the Cape Verde Islands, to Pernambuco, Brazil.

MESSRS. Siemens Brothers announce that their new steamship Faraday, built specially for the purpose of laying cables, will commence, on the 15th of April, to take on board the cables which is to be laid direct to the United States.

COMMUNICATION by cable between Havana and Santiago de Cuba has been re-established.

Journal of the Telegraph.

This Journal is issued on the 1st and 15th of each month. Its circulation is over 8,000. It goes to every State, Territory and Province on the Continent. It has become a necessity, and is always welcomed as a friend. No better medium for advertising exists.

TERMS:

TWO DOLLARS PER ANNUM IN ADVANCE.

Address—

JOURNAL OF THE TELEGRAPH,

Western Union Telegraph Company,

145 Broadway, New York.

NEW YORK, APRIL 1, 1874.

HALF RATE MESSAGES.

A correspondent asks, why is the treatment of this class of business exceptional? We reply that it is, itself, exceptional, and demands special treatment. It is not self-sustaining. It is permitted only to utilize vacant time, and meet a limited public want. It is done below a paying tariff, and, if unduly stimulated, would destroy the revenue which makes the half-rate system possible. Between distant places it is already largely superseding the full rate service.

Now the Company only require that a service which they are doing for half price be paid for in cash. It is not a hard condition. Why it should be regarded as obnoxious, we fail to perceive. Practically all messages are required to be prepaid. The demand in the case of half rates is only more emphatic.

CORRESPONDENTS should bear in mind that communications intended for publication should be written upon one side only of the paper. Also that words should not be abbreviated. Spell every word with its full complement of letters. When this is not done by the writer it has to be by the editor.

SUPERINTENDENTS and others who may have on hand surplus copies of the JOURNAL of October 15th and December 15th, 1873, would confer a favor by returning the same to this office. Our supply is exhausted.

THE legal rate of postage on the JOURNAL OF THE TELEGRAPH, addressed to its regular subscribers, is twenty-four cents per annum, or six cents per quarter, payable in advance. Subscribers who receive their copies by letter-carriers will please hand the annual or quarterly postage to the carriers, taking their receipts. If any higher rates are demanded, report the facts to the local Postmaster.

OBTAINING ANSWERS TO MESSAGES.

In the early days of the telegraph people were reluctant to believe and slow to avail themselves of the new facilities for communication then offered. As a means of inspiring belief, and, perhaps, with the view of increasing the revenue of the lines, an unfortunate precedent was established. The public were encouraged to regard the obtaining of replies to telegrams as an evidence of efficiency and as an implied obligation upon a telegraph company. We do not now desire to pass upon the wisdom of this procedure. With the limited amount of business then transacted by telegraph, the comparatively few extra free messages sent over the wires to secure the desired result, occasioned no embarrassment, while it afforded satisfaction. But with the growth and development of the business the concessions which had been made in this direction became onerous, and at this day are insupportable. Why the telegraph in accepting a message for transmission should be obligated to procure an answer, is not clear, yet it seems to be generally understood that unless this is done the obligation to forward a dispatch is unfulfilled.

That it is desirable to procure answers to messages cannot be questioned. The telegraph companies make great effort at the time of delivery to accomplish this, and failure can be attributed to no lack of endeavor on their part. Why, in such an event, should they be required or expected to send one or more free messages, each costing as much to transmit as the original, in order to make an unready, unwilling or negligent person, accede to the wishes of his correspondent? Yet this is generally expected, and the expectation is the legitimate result of the policy established in the early days.

It should be understood that when a message is delivered the obligation to the customer ceases. Procuring an answer is in no sense part of the contract, and, while it is admitted that in obtaining a reply, the service would be more perfect and satisfactory, the telegraph should not be expected to insure it. The function of the telegraph is to transmit messages when offered, and not to, in its own name, and at its own expense, force people to write them for the benefit and satisfaction of third parties.

When a telegraph company has promptly transmitted and delivered the message for which it has received pay, it has performed its whole duty. If possible, an answer is procured, but any extra service in this direction, to accommodate the public, while cheerfully performed, should be paid for.

THE MISSING REPORT.

Not a few of the stockholders of the Atlantic and Pacific Telegraph Company would be gratified by the publication of the Treasurer's report for 1873, which was referred to but not submitted with the annual report of the President of that Company. As the Company is free from debt, and has the ability to construct lateral extensions without cost, a very flattering exhibit is confidently looked for.

DEPARTURE OF MR. ORTON FOR EUROPE.

HON. WILLIAM ORTON, President of the Western Union Telegraph Company, left in the steamship *Republic*, on Saturday, 28th ult., for a brief trip to Europe for the benefit of his health, which has been somewhat impaired by his excessive application to business. His contemplated departure having become generally known, a large number of friends assembled on the revenue cutter *Jasmin*, at the Battery, and proceeded to the pier at the foot of West 24th street, where Mr. Orton was taken on board, and after a brief excursion in the river and the serving of a sumptuous luncheon, was escorted to the steamer. Among the friends assembled to wish him a pleasant voyage, were Messrs. A. B. Cornell, George Opdyke, Augustus Schell, George Walker, Norvin Green, W. K. Thorne, Wilson G. Hunt, O. H. Palmer, E. S. Sanford, John Steward, James H. Banker, George Jones, Cyrus W. Field, George H. Mumford, George B. Prescott, A. W. Greenleaf, B. R. McAlpine, Thomas T. Eckert, L. G. Tillotson, Marshall Lefferts, J. D. Reid, J. C. Hinchman, R. T. Clinch, Joseph Russell, Augustus Smith, A. B. Chandler, F. J. Grace, S. B. H. Vance, R. H. Rochester, John B. Van Every, Wm. Hunter, and Wm. Schmultz.

After placing the departing guest on the *Republic* the cutter accompanied her for a short distance down the harbor, when the friends gathered on board bade Mr. ORTON adieu in a series of prolonged and hearty cheers. Although our President's trip to Europe is mainly one for recuperation, yet he will, while abroad, embrace the opportunity to look after the cable interests of the Western Union Company, which are of considerable magnitude.

THE following preamble and resolution was offered in the House of Representatives, at Washington, on Monday, 28d ult:

Whereas, It is believed that a number of important telegraphic dispatches recently sent from this city have been surreptitiously obtained by unprincipled persons, and it appears that the insufficient protection of the various telegraph offices located in the south wing of the Capitol renders it easy for unprincipled persons to obtain copies of private telegrams; therefore, be it

Resolved, That the architect of the Capitol be and he is hereby directed to cause the telegraphic instruments located in the corridors and galleries of the south wing of the Capitol to be so isolated that it shall be impossible for any unauthorized persons to listen to or obtain copies of private telegrams sent to or from the Capitol.

The unprincipled persons referred to are understood to be a prominent member and a clerk in his employ. It is a matter of common report that this clerk, who is an experienced telegraph operator, and a remarkably good "sound reader," is in the habit of lounging about the telegraph offices, near the door of the House, and by listening to the instruments obtaining copies of such dispatches as he thinks would interest his principal.

THE electric telegraph is being extended to the Midland districts of South Africa, and will thence be continued to the Diamond Fields, and probably further on to the Gold Fields.

THE NEW CODE OF RULES.

Before commencing the list of suggestions sent to us we beg to present one which we think worthy of attention. It is in reference to messages requiring answers, one of the very vital parts of the business, and whose success depends much upon the treatment of this portion of it. The idea is a simple one. We propose that a card be printed bearing upon it, in good clear type, the following :

"The reply to this message is desired at once and has been paid for. Enclosed is a blank on which to write it. The bearer will wait for it. Please do not detain him."

This card and a blank No. 2 to be placed with every message where a reply has been provided for.

It is true that this information is abbreviated on the envelopes, but they are not always noticed. Something which is sure to be read after the message has been read is needed.

In like manner, we think a similar card might be used for ordinary messages somewhat as follows :

"The answer to the enclosed message, if not more than ten words, will cost —. A blank is enclosed on which to write it. The bearer will wait for it if desired. Do not detain him."

It is very evident that service messages are the result, very largely, of want of efficiency in this branch of the service.

SUGGESTIONS RECEIVED MARCH 11TH TO 24TH.

From Cincinnati, O.

- 1.—Print in Book of Rules specimens of "regular," "forwarded," and "other line" messages.
- 2.—To use different colored paper in receiving different classes of business.
- 3.—Modify Rule 54 by word "verbal" instead of "written reason."
- 4.—Rule 77 omit "and a copy of message sent by mail."
- 5.—Wherever possible pay messengers by the message. It insures promptness, and brings answers.
- 6.—Managers of Offices should be instructed to interrogate his staff upon their knowledge of the Rules.
- 7.—Rule much needed establishing definitely Sunday hours.
- 8.—Delivery of half-rate messages on Sunday to be prohibited unless called for.
- 9.—Rule requiring "Paid," "C. O. D.," or "D. H." to follow office call.

From Brimfield, Ind.

- 10.—Rules should give blank forms with full directions for their use.

From Oswego, N. Y.

- 11.—Prepayment should not be exacted for quotations or markets, sent to responsible parties at their request.
- 12.—Rule 77 omit words "By telegraph."
- 13.—Rule 54. Strike out words "who will notify the office from which message is received."
- 14.—Either a wholly cash system or permission to charge "Reds" in accounts permitted to be kept.
- 15.—Print 82 in italics.
- 16.—Notices of non-delivery to be given only in case of want of address.
- 17.—Substitution of words "Answer paid" and "Report delivery" for signals 33 and 34.

From Cleveland, O.

- 18.—That free messages be abolished.
- 19.—Priority to be equivalent to highway robbery.
- 20.—Fixed rates same at all times to all people.
- 21.—Deposits should be required for open accounts to secure Manager and prevent absorption of his time.

From Reading, Pa.

- 22.—Place the "via" as "via Rochester" after the check, so as to aid correct entry.
- 23.—Rule checking notices of non-delivery addressed to sender at half rates.

North East, Pa. and Trenton, Mich.

- 24.—Rule restoring transmission of amounts with checks, want of which causes great labor and innumerable errors.
- 25.—The "JOURNAL OF THE TELEGRAPH" to be so filed as to be accessible to all employes.

From Clinton, Iowa.

- 26.—I suggest that all free messages be sent paid and booked same as other business, credit being taken therefor in account.
- 27.—Revocation of Executive Order 152, which is causing large loss.
- 28.—Rule stating distinction between a "Repeated" and "Insured" message.

From Centralia, Mo.

- 29.—Precede collect check by signal C. K.

From Emerson, Iowa.

- 30.—Nineteen-twentieths of my check errors would have been avoided had the amount been given with the check, and name of office given where the check was not direct.
- 31.—Market reports cut off by Ex. Order 152.
- 32.—A good guarantee should permit messages to be sent "collect."
- 33.—Amend 54 by adding "such notice will be sent collect at half the regular tariff rates."

From Philadelphia, Pa.

- 34.—A limited time should be given for settlement of error sheets.
- 35.—Superintendent should be notified within a certain number of days what offices fail to answer inquiries.
- 36.—Notation should be made on Register Book opposite last day's entry for the month, to which error sheet refers when and how returned, and how much remitted in settlement.
- 37.—All blanks should be numbered.
- 38.—All rules referring to error sheets should be printed upon them.
- 39.—Note should be printed in Tariff Book showing that every employé is required to have a copy of Book of Rules and conform thereto.
- 40.—Modification of old meal roll to conform to voucher 10.
- 41.—Instructions to linemen.
- 42.—In Rule 57, twenty-five should be fifteen.
- 43.—Rule to prohibit abbreviations by operators.
- 44.—More complete directions for delivery needed.

From Millen, Ga.

- 45.—Make collect check read "Collect at" for further security.
- 46.—Half-rate charges for office delivery notices—Rule 13; for office non-delivery notices; for office quick answer requests, &c.

From Denver, Col.

- 47.—Messengers in towns of over 10,000 inhabitants to be provided with a belt and pouch, number 2 blanks and pencil to facilitate replies. Also a cap.
- 48.—Daily delivery cards instead of books.
- 49.—Insured messages to be repeated back from destination to the sender, and double tolls charged.
- 50.—A 20-word basis, and all except date counted.
- 51.—Blanks No. 1 to be ruled, and small figures placed at left hand of lines to facilitate counting.
- 52.—Abolishment of night rates.

From Whitehall, N. Y.

- 53.—The necessity of adhering to Rule 77.
- 54.—Nos. 1 and 44 blanks should be same form as Nos. 2 and 45.

From Cleveland, O.

- 55.—Rule governing error sheets, "that all offices be required to so keep a record of all messages received or sent as to be able to tell, when asked for a copy to explain a deficit, what office it was received from or sent to, together with time sent or received, and that this information accompany the copy."
- 56.—Count all words alike except "New York."
- 57.—Rule needed defining responsibility of managers.

From Brunswick, Me.

- 58.—Words "answer by telegraph" should be sent free.
- 59.—Definite instructions with all messages for special delivery.

From Syracuse, N. Y.

- 60.—Issue a tariff sheet to transfer offices giving a fixed rate (except the percentage) for transfers.

From New York.

- 61.—Rule directing all offices to start a fresh number sheet every morning, including Sundays. Large number of offices run Saturday and Sunday numbers together.
- 62.—Reserve several blank pages in Book of Rules for pasting in Executive Orders and Local Rules.
- 63.—Rule regulating rates of delivery at small interior offices. Some charge 10 cents for 100 yards, others 50 cents inside of a mile.
- 64.—Rule stringently forbidding use of old messages as waste paper. Some messages have been found thus exposed which were only a few months old.
- 65.—Practice of operators leaving their office for hours, and having their business sent to next office until they return.
- 66.—Number service messages thus, S. M. 1, S. M. 2, &c.
- 67.—Operators ought to pass examination in Book of Rules before appointment.

From Plymouth, Pa.

- 68.—Check to follow address, and, in addition, collect to follow signature.

From San Antonio, Texas.

- 69.—Require numbers in addresses to be sent in words.
- 70.—Rule for counting "Q. M.," "A. D. C.," "I. T.," "D. C.," in Government messages.
- 71.—Rules regulating transmission of various classes of priority messages.

Oakland, Cal.

- 72.—To send free extra words on forwarded messages.
- 73.—Substitute words "Report Delivery," instead of signal 34.
- 74.—Payment of all office messages.
- 75.—Greater attention to answers by messengers.

Milwaukee.

- 76.—Deposit of double amount of reasonable charge for special delivery and words "by special messenger paid five dollars deposited" follow signature and be charged for.

Wilmington, N. C.

- 77.—Abolish book and print rules for each department in cards.
- 78.—Change from No. 1 to old form, so as to get 5 words on a line.

Little Rock, Ark.

- 79.—Rules 10 and 83 should be consolidated.
- 80.—Place to be assigned to signals "33" and "34," and charged.
- 81.—State class of messages in Rule 20 which should be referred to Dist. Supt.
- 82.—Repeated messages to be repeated from destination.

San Francisco, Cal.

- 83.—Rule 6. Figures should be sent free after the words, and figures on addresses should be written.
- 84.—Thorough revision of Rule 9.
- 85.—Rule 12 is illegal.
- 86.—Rule 45. Number of the frank to be transmitted with the check.
- 87.—Rule 88 should be changed so as to prevent remittances with check error explanations, and enter amount under "check errors" in monthly statement. This would make Rule 89 unnecessary.

From Springfield, Ill.

- 88.—Add compendium on book-keeping to book of Rules.

THE SERVICE.

WESTERN UNION TELEGRAPH COMPANY.

JANUARY, 1874.

APPOINTMENTS.

Miss Sarah Orr, 145 Broadway.
Miss Selva Seaver.
P. J. Cummings, St. Denis Hotel.
S. Fones, Merchants' Hotel.
T. Geary, U. S. Hotel.
Miss J. Baylis, Oyster Bay, L. I.
M. J. Curran, Brooklyn, N. Y.
H. Coombs, Jr., Burlington, Vt.
F. B. Farnsworth, Braintree, Mass.
Miss L. Lovell, Belchertown, Mass.
G. L. Andon, Fitchburg, Mass.
A. W. Cook, Mount Holly, Vt.
L. Shelley, Putney, Vt.
J. D. Grant, Three Rivers, Mass.
G. F. Herrick, Westminster, Vt.
J. A. Osborne, Albany, N. Y.
G. H. Morgan, Chappaqua, N. Y.
J. V. Whitbeck, Coeymans, N. Y.
W. H. Role, Fort Ann, N. Y.
C. A. Shaeffer, Elmira.
F. Hardy, N. Andover, Mass.
Mrs. Atwell, Boston, Mass.
Chas. Painter, Orwings Mills, Md.
H. Murray, Reisterstown, Md.
H. L. Beard, Union B'dge.
J. W. Cawee, Waynesboro, Pa.
M. E. Shreiner, Westminster, Md.
J. Hillary, Cumberland, Md.
Geo. Sherwood, Nanawigewock, N. B.
Miss A. M. Thomas, Point Lepeaux.
J. Parker, Jr., Baltimore.
W. W. Sell, Bingen, Pa.
W. H. Boggs, Harrisburg, Pa.
W. S. Wilson.
A. Hopple, Millerstown.
J. L. Buckman, Pottsville.
W. Dunn, Riverton, N. J.
H. L. Collins, Smyrna, Del.
G. H. Pennock, Trenton, N. J.
H. Ford.
F. Swann.
W. N. Gove, Washington, D. C.
W. H. McKeldin.
O. W. Runyan, Wilkesport, Pa.
F. Helntze, Woodbridge, N. J.
C. B. Stevens, DeSota, Wis.
E. Woodbury, Des Moines, Ia.
J. J. Curley, Clarksville, Mo.
J. T. Houghton, Palmyra.
J. A. Fisher, Kearney, N. B.
H. Brundage, Va. City, Mon.
J. Culler, Brownsville, Pa.
Miss K. E. Alter, Belle Vernon.
W. H. Hamilton, Coal City, Pa.
J. T. Davison, California.
E. J. Ward, Connelville.
M. E. Davison, Davidson's Ferry.
R. L. Riggs, McKeesport.
L. S. Newmeyer, Mt. Pleasant, Pa.
J. W. N. Gibbs, Oil City, Pa.
S. W. McKee.
W. P. Lucas, Parker's Landing, Pa.
E. Bolton, Tidoute, Pa.
C. C. Klump, Triumph.
W. A. Strong, Titusville, Pa.
C. E. Cloud, Wheeling, W. Va.
G. A. Hamilton, Pittsburgh, Pa.
W. H. Marshall.
R. W. Ledwith.
M. M. Prescott.
W. H. Myers.
H. L. Fitch.
J. Byrne.
S. M. Dunlap, Cincinnati, O.
R. C. Bliss.
S. H. Stewart.
A. C. Lewis.
T. F. Ross, Columbus, O.
J. Voorhees, Dayton, O.
W. F. Hansacker, Dayton, O.
J. B. Curtis, Hamilton, O.

Miss M. M. Parks, Franklin, Mass.
H. Whitney, Falmouth, Mass.
J. B. Gaynor, Hartford, Ct.
H. S. Hawley, Hawleyville, Ct.
Miss E. C. Thayer, Milton, Mass.
J. E. Stark, Providence, R. I.
A. S. Parks, Russell, Mass.
C. M. Hodges, Roxbury, Ct.
Miss J. M. Arnold, S. Adams, Mass.
Miss B. C. Marshall, Ware, Mass.
A. D. Brewer, Worcester.
A. G. Baker, Washington, Ct.
C. B. Somers, New Haven.
D. Burgess, Jamesville, N. Y.
J. H. Covert, Susp. Bridge, N. Y.
J. R. Longstreet, Whitney's Pt.
J. L. Besore, Clear Springs.
Miss B. C. Helman, Emmittsburg, Md.
J. H. Repp, Middlebury, Md.
B. F. Willets, Des Moines, Ia.
C. R. Stevens, Dubuque.
L. F. Sheldon, Galesburg, Ill.
W. E. Davidson, Keokuk, Ia.
W. R. Arnold, Le Claire.
C. M. Kinnaman, Milwaukee.
O. Tompkins, McGregor, Ia.
E. Myers, Peoria, Ill.
W. C. Long, Chicago, Ill.
Geo. S. Hall.
C. L. Fortier.
E. W. Dennis.
R. B. Pearson.
J. F. Stevely.
J. W. Iredale.
D. H. Londerback.
Wm. Harrigan.
H. W. Sumwalt.
J. J. Curley, Clarksville, Mo.
Eugene Scott, Hannibal.
A. G. Haight, Jefferson City.
E. A. Keene.
W. P. Lampton, St. Louis.
C. W. Hammond.
H. J. Forman.
A. H. Babb.
H. McMeans.
J. F. Harris, St. Charles.
E. E. Brunell, Pittsburgh, Pa.
M. E. Pangburn, Elizabeth.
C. T. Roberts, Evansburg.
J. Held, Freeport.
M. A. Atter, Fayette City.
C. A. Walker, Frostburg.
G. Glotfelty, Grantsville, Md.
M. L. Fletcher, Jefferson, Pa.
G. W. Luttis, Lock No. 3.
W. P. Speakman.
U. W. Doring, Morgantown, W. Va.
W. E. Wilson, Monongahela City, Pa.
J. Faddis, Rice's Landing, Pr.
V. E. Smith, Salisbury.
E. Hewitt, Uniontown.
G. S. Jeffrey, Waynesburg.
R. W. Potter, Cleveland, O.
C. A. Allen.
H. Stevenson, Greenville.
Geo. Farnsworth, Indianapolis.
W. J. Hovey.
Jno. Dalton.
E. C. Reihle, Terra Haute, Ind.
J. E. Mattoon, Cincinnati, O.
R. C. Bliss.
Jno. Swindell.
R. H. Brooks, Forts, Tenn.
W. S. Reamer, Marion, S. C.
J. M. Jeffries, Monticello, Fla.
W. F. Hefflin, Quincy, Fla.
R. G. Callum, Savannah, Ga.
R. J. McCarthy, Eufaula, Ala.
Miss M. McNeill, Camilla, Ga.

J. R. Patton, Middletown, O.
W. C. Wesson, Zanesville, O.
J. S. Burress, Concord, N. C.
J. A. Yager, Greenwood, Va.
H. P. Cammack, Louisa, C. H. Va.
M. F. Kendall, No. West, N. C.
T. H. Johnson, Rogersville, Tenn.
L. B. Pennington, Tarboro, N. C.
W. Rutland, Wilmington.
E. Priddy, Bartlett, Tenn.
W. A. Culp, Clinton, Ky.
A. M. Chambers, Georgetown, Ky.
C. A. Read, Johnson.
W. A. L'Hommedieu, Louisville, Ky.
W. DeGrove, Louisville, Ky.
E. G. Foote, Memphis, Tenn.
J. H. Ford, Nashville.
J. U. Rust.
R. M. Turpin, Bakers.
W. R. Fountain, Marquez, Tex.
H. D. Fagan, Overton.
A. E. Neal, DeVal's Bluff, Ark.
C. W. Priddy, Forest City.
J. P. Morrison, Jacksonport.
G. Montague, Little Rock.
H. M. Owen, Long View, Tex.
J. B. Moore, Malvern.
J. S. Neylor, Newport, Ark.

RESIGNATIONS.

Miss A. Middleton, 145 B'way.
F. P. Ross.
C. W. Miller, Elmira, N. Y.
Miss Belle Rest, Baltimore, Md.
Jno. S. Grasty.
W. J. Rudio, Bernardsville, N. J.
T. P. Cluck, Millerstown, N. J.
C. W. Rothrock, Old York Roads, Pa.
H. E. Bradford, Smyrna, Pa.
W. H. Bush, Phila.
W. S. Beverlin, Trenton, N. J.
C. D. Kewton, Des Moines, Ia.
A. Smith, No. Andover, Mass.
G. S. McCord, Bangor, Me.
O. D. Stickney (Dead), Portland, Me.
Miss Isa Crocker (Dead), Boston, Mass.
Miss E. Vialle, Boston, Mass.
Miss A. R. Carley, Franklin, Ma.
W. H. Hewins, Falmouth, Md.
J. A. Osborne, Hartford, Ct.
Mrs. H. M. Chapman, Milton, Mass.
Miss M. J. Coombs, Russell, Ma.
E. M. Arnold, So. Adams.
H. M. Corney, Ware.
G. H. Lowe, Watertown, Ct.
E. A. Keene, St. Louis, Mo.
A. G. Haight.
J. E. Fleming.
L. V. St. Clair, Kearney, N. B.
E. Stark, Va. City, Mon.
H. Rosensteel, Connellsville, Pa.
W. W. White, Franklin, Pa.
M. L. Clark, McKeesport.
A. Lyon, Mt. Pleasant.
C. Johnson, Oil City, Pa.
F. M. Canfield, Triumph, Pa.
A. Love, Middletown, O.
W. C. Buchanan, Jamesville, O.
G. W. Alley, Jr., Concord, N. C.
C. H. Smithers, Greenwood.
J. C. Talley, Louisa, C. H. Va.
D. D. Millan, No. West, N. C.
J. F. Ross, Rogersville, Tenn.
J. F. Thomas, Tarboro, N. C.
A. B. Garland, Wilmington.
C. W. Priddy, Bartlett, Tenn.
C. W. Johnson, Louisville, Ky.
J. U. Rust, Memphis, Tenn.
J. W. N. Esleman, Bakers, Tenn.
J. J. Bowles, Forts.
S. B. Pennington, Marion, S. C.

TRANSFERS.

Miss K. Doubleday, 145 Broadway, Flatbush, L. I.
R. S. Emmerson, Rondout, N. Y., 145 Broadway.
A. W. Peakes, 181 Pearl street, 145 Broadway.
Miss Lillie Spear, Oyster Bay, L. I., Relief Operator.
Miss L. M. Strachan, Flatbush, 145 Broadway.
P. Mason, Oxford, N. H., Fairlee, Vt.
A. D. Brewer, Fitchburg, Mass., Worcester, Mass.
L. Smith, Hillsdale, N. Y., Croton Falls.
Miss L. Cummings, Statteburg, N. Y., Fishkill, N. Y.
Geo. Wakeman, Chappaqua, N. Y., Hillsdale.
J. A. Smith, New Orleans, La., Vermillion, La.
H. C. Davis, Shreveport, New Orleans, La.
B. S. Pillow, DeVal's Bluff, Ark., Jefferson.
H. M. Owen, Forest City, Lonake.
J. S. Storey, Baltimore, Md., Annapolis, Md.
J. J. Riegel, Bingen, Pa., Old York Roads.
B. P. Shreene, Communipaw, N. J., Jersey City.
W. Gregon, Camak, Ga., Covington, Ga.
M. T. Heard, Covington, Ga., Camak.
Laura Merritt, Berkeley, Cal., San Francisco, Cal.

DATING from the Christian Era was commenced in Italy in 525, and in England in 816.

SIGNALS to be used at sea were first contrived by James II., when he was Duke of York, in 1665. They were afterwards improved by the French commander, Tourville, and by Admiral Balchen.

THE MAGNETISM OF ELECTRO-MAGNETS.—Mons Gaugain, as the conclusion of an extensive investigation into the construction of electro-magnets, states that in order to explain his observations it is necessary to conclude that a bar of iron contains two shells of positive magnetism separated by a layer of negative magnetism. One can easily see how to superpose a greater or less number of layers, alternately, positive and negative, by passing through the coils of the electro-magnet a moderate number of alternately positive and negative currents of diminishing intensity, the law of diminution not being a matter of chance. It is, however, necessary that the intensity of the induced current should decrease with a definite rapidity. When this intensity diminishes too slowly, the iron which is submitted to its influence is in the same state as if it had been submitted only to the influence of a current feeble than that which has been employed. It is then feebly magnetized, and if subjected to the action of a current of greater intensity, it is magnetized equally in both the positive and negative senses. It then behaves as if it were really in a neutral state. Consequently, whenever in the course of his researches, Gaugain, desires to demagnetize a bar of iron, he submits it to the action of a series of alternating currents whose intensity decreases gradually and slowly. He supposes that the same method would serve to demagnetize steel.

SITUATION WANTED,

BY A
FAIR PAPER OPERATOR.

Address W. G. S., Bamby (S. C.) R. R., Barnwell Co., S. C.

THE "SNAPPER."

PRICE,  30 CENTS.

How the boys "tumble to it."

READ THE FOLLOWING:

St. Louis, March 20th.

R. W. POPE—
Dear Sir:—Enclosed please find \$1.20, for which please send four of your "Snapper" Sounders to the following addresses:

E. A. ALLEN, W. U. T. Office.
H. J. FOREMAN, " "
W. J. FOT, " "
ED. A. KEENE, Jr., " "

Your little Sounder has created quite an excitement among the boys here.
Later—Still they come. Send one more to the following address.

MARC. GAUTIER, W. U. T. Office.
Ed.

P. S.—Another county heard from. Send one more to
CHAS. E. BURROWS, W. U. T. Office.
Total enclosure for 8 Sounders, \$1.80.

EDDYVILLE, La., March 21.

DEAR SIR:
Please find enclosed 60 cents for two more of your "Snapper" Sounders.
If you get this before filling order of the 20th, please enclose the four in paper box. Think will send for couple more in a week.
They make more fun for their price than anything I ever saw.
Please hurry them along; can hardly wait.

EDD. J. EGGETT,
Manager W. U. Office.

DELHI MILLS, Mich., March 24.

DEAR SIR:
Please send me three more of the "Snappers." Best thing out. Boys all like them. Please find enclosed 90 cents.
Respectfully,
H. HALL.

SENT POST PAID FOR 20 cts., OR SIX FOR \$1.50.

Purchasers in the British Provinces will please remit 5cts. for additional postage.

R. W. POPE,
BOX 5278. NEW YORK

JOURNAL OF THE TELEGRAPH.

VOL. VII. NO. 8.

NEW YORK, APRIL 15, 1874.

WHOLE NO. 155.

THE ENGLISH TELEGRAPHS.

By GEORGE B. PRESCOTT.

For the information contained in the present and previous numbers of the JOURNAL relating to the English telegraphs I am greatly indebted to Frank Ives Scudamore, Esq., C. B., General Manager, and R. S. Culley, Esq., Engineer-in-Chief Post-Office Telegraphs; Henry Weaver, Esq., General Manager Anglo-American Telegraph Company; Messrs. Eaton, Preece and Lumsden, of the Engineer-in-Chief's staff, and to many other gentlemen connected with the Telegraph Service in England, who extended to me every facility within their power to acquire a complete knowledge of the subject.

THE UNDERGROUND LINES.

The system of underground lines in England is both extensive and well constructed, embracing 8,000 miles of wire and nearly 100 miles of iron piping.

The conductors usually employed for underground lines consist of No. 18 copper wire, covered with gutta percha to the gauge of No. 7. In order to keep the gutta percha from the atmosphere, the exposure to which would cause it to crack and decay and thus destroy the insulation, it is tarred and then covered with linen tape and tarred again. The preparation of tar through which the gutta percha and taped wire is drawn is composed of one quart of raw linseed oil to two gallons of Stockholm tar, and is applied warm.

The wires, when thus prepared, are cut into lengths of four hundred yards, and as many as are required to be laid in one tube are made into a loose cable, and tied together with tape at distances of six feet apart. When the wires are drawn into the tubes the tapes are removed and the wires permitted to lay loosely in the pipes.

The tubes into which the wires are drawn are cast-iron socket pipes of two, three, and four inches diameter—the size employed depending upon the number of wires to be laid down. The two-inch pipe holding 25 wires; the three-inch, 70 wires; and the four-inch, 120 wires. The pipes are laid down under the flagstones at an average depth of twenty inches, and the joints are filled with lead.

Oblong drawing-in, or flush boxes, made of cast-iron, thirty inches long by eleven inches wide and twelve deep, with lids formed of an iron frame into which a piece of flagstone is fixed, are also placed under the sidewalk near the curbing, at distances of fifty yards, in the city of London, and one hundred yards apart outside the city. The pipes enter these

boxes through a curved aperture near the bottom, which is open.

As the pipes are laid down, an iron wire of No. 8 gauge is strung through them to draw the cable in with. When the wires are to be laid down they are tied into loose cables, as above described, in lengths of 400 yards each, and brought to the middle of a section of 400 yards of tubing. One end of the cable is then attached at the flush box to the iron wire extending through the pipe in one direction,

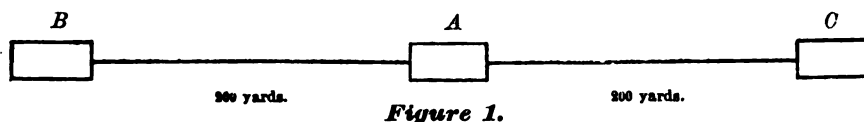


Figure 1.

and the other end of the cable to a similar wire extending through the pipe in the opposite direction. The cable is then drawn through both sections at the same time—a distance of 400 yards—the greatest distance that any part of the cable has to be drawn in the tube being 200 yards.

The wires are numbered at each 400 yards, and the boxes are arranged so that the joints and numbers are always in the box. The wires may be replaced in the pipes for repairs or other purposes at



Figure 2.

any time without interrupting communication, or disturbing the pipes. When a section is found to be defective and to require renewal, a cable of wires of the required length is brought to a box near the defective wire and inserted in a loop between it and the next section, and as the defective piece is drawn out of the pipe the new piece is drawn in. Extra wires are always provided when new wires are drawn in, so that renewal is not required until several wires have failed. It is impossible to draw

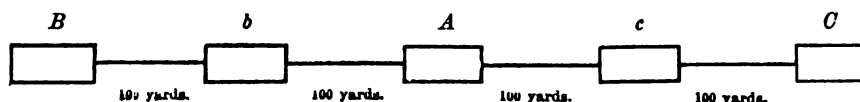


Figure 3.

out a portion of the wires without injuring the coating and thereby destroying the insulation. Hence when renewal becomes necessary all the wires in the section are replaced. The pipes are well cleaned and tarred inside while hot in order to prevent rust, which causes the wires to adhere so strongly to the iron as to become difficult to detach them.

The cost of laying down three-inch cast-iron socket pipe for underground wires is three shillings and nine pence per yard, or £330 per mile. This includes the cost of the pipe and jointing with lead, the taking up of the pavement, putting the pipe in place and repaving.

The cost per wire for drawing in the pipes depends somewhat upon the number of wires. The average cost of putting 60 wires in a pipe, including jointing and all other incidental work, is £56 per mile.

The cost of conducting wire for underground lines, consisting of copper wire of No. 18 gauge, covered with gutta percha to No. 7 gauge, taped and tarred, is £17 per mile.

The total cost per mile for sixty underground wires is £1,406, or £23 8s. 7d. per mile of wire.

The underground system in England gives comparatively little trouble, and is more favorably regarded than the over-house plan, the great defect in which is imperfect insulation.

For tunnels, copper wires, insulated with gutta percha, and then tarred, taped and again tarred, are laid in a wooden trough and attached to the wall. The trough has a cover, coated with zinc, and fastened with tie wire, instead of nails, to prevent injury to the wires.

In addition to the underground lines in the large towns, several others have been laid down between London and the chief commercial and manufacturing towns in England.

In 1853 the Magnetic Company completed a line between London and Manchester, consisting of ten wires laid in grooved boarding, the wires being of No. 16 copper, insulated with gutta-

percha to No. 3 gauge. The wires were placed parallel to each other, in two rows, and were served over with two coverings of jute soaked in Stockholm tar.

The boarding used was creosoted Baltic timber, 3½ inches square, and was placed at the bottom of a trench two feet deep. The cable was coiled in lengths of about 1½ miles on a drum placed on wheels, and was drawn over the ground by a horse.

When a convenient length was paid out along the road, it was lifted up and placed in the boarding, which was then covered by a wooden top and nailed on. Where iron piping was required split pipes were used. At the end of every mile

and a half, and also where it was required to make a set of joints, test-boxes were inserted, two feet long by three inches deep, at the same level as the board. Where boarding was used these boxes were wooden, and iron where the piping was iron.

The tests of the wires were taken both for continuity and insulation. All the wires were marked at their ends with lead numbers.

Before the work was finished a great number of faults were found, generally due to nailing on the cover, the nails frequently being driven into the gutta-percha. A long length of line had all its nails renewed, and the boarding bound with wire. A few

years after the completion of the work the wires continually failed, and when a fault was located in any wire the cable was opened and a good wire substituted for the faulty one. Subsequently the line was tested in five-mile sections, and when any section was found defective it was replaced by an overhead line, and the underground cable removed. This course gradually resulted in the replacement of the line by an overhead one, until at length none of the original work was left. The faults which appear to have caused the abandonment of the gutta-percha cables were the drying up and cracking of the gutta-percha in sandy ground; the rotting of the gutta-percha in dirty, stagnant water; the formation of fungi on the gutta-percha, near oak trees; the destruction of the gutta-percha by gas water, near gas-pipes; the burning of the gutta-percha by the carelessness of the workmen engaged in laying it; the rotting of the gutta-percha under the lead numbers, and the pricking of the wires and omitting to seal the places up.

The underground lines in the Isle of Wight consisted of bare india-rubber wires put down without any protection whatever. The wires were abandoned in a few years afterwards.

In 1852 the Electric and International Company laid down eight wires, insulated with gutta-percha, between London and Liverpool and Manchester. The wires were laid in earthenware pipes. The line was broken up in 1862, and the old materials sold for enough to build an overhead line to replace it.

Since the Telegraphs have gone into the hands of the Government, a new underground line has been laid down between Liverpool and Manchester, consisting of fourteen conductors, laid in iron and stoneware pipes. The length of the line is about 86 miles, and about two-thirds is laid down in stoneware pipes and one-third in iron pipes.

The iron pipes are 8-inch cast iron in 9 feet lengths, with sockets for joints. The stoneware pipes are 8 inches in diameter and three feet in length. The depths at which the pipes are laid are one foot for the iron and two feet for the stoneware. The iron pipes, previous to laying down, were cleaned out with a heavy iron chain, for the removal of any sharp points and burrs. The stoneware pipes were cleaned with a rod with two pieces of iron like half pipes, kept apart by a spring.

The pipes when laid down were carefully adjusted, so as to fit closely, and the joints were then made. As each pipe was laid in its place a No. 16 galvanized iron wire was threaded through.

The joints in the iron pipes were made by first ramming in some yarn, to prevent the molten lead from running into the pipe. A clay mould was then formed around the pipe, and the lead run in—the quantity of lead used for this purpose was about one pound per joint.

In the stoneware pipes the joints were made with Stourbridge clay, which, whilst making a good joint for the prevention of dirt entering the pipe, is sufficiently porous to allow water to percolate through it.

At the distance of every 200 yards, in straight lines, were placed flush boxes, into which the pipes were led so as to just project within, the space around them being protected so as to prevent dirt from falling into the box. The mouth of each pipe was also stopped to prevent dirt from getting into the pipe.

The cables were divided into 403 and 404 yards lengths, and the whole work was subdivided into 400 yard lengths—the boxes at these intervals being termed joint boxes, and the intermediate drawing-in boxes. The joint boxes were placed at the distance of 400 yards apart. The intermediate or drawing-in boxes, in a straight line, were placed at 200

yards from a joint box, or half way between the joint boxes, but where there were curves in the road, or it became necessary to make a cross, these intermediate boxes were increased as the occasion required.

The cables used in this work consisted of a copper wire of No. 18 gauge (39 lbs. per mile), covered with gutta-percha to No. 7 gauge (40 lbs. per mile), and were manufactured in the ordinary way—being covered with two coats of Chatterton's compound, alternating with two of gutta-percha, and having a total weight of 85 lbs. per mile.

The core, as it was manufactured, was cut off into special lengths for the length of cable required—404 yards. The wires so cut off were wound on to bobbins, which were placed in a machine holding six bobbins only. The bobbin containing the center wire was placed behind the machine, through the center of which the wire passed—the six wires being laid helically round the center. The cable was then passed through a bath of cold Stockholm tar, in which was a quantity of fine cork dust, to give it more solidity, and was then covered with two servings of tarred tape laid on in opposite directions—the tape having a double selvage.

DRAWING-IN CABLES.

The several holes where boxes were located having been opened and the boxes cleaned out, two strong drawing-in wires of No. 11 gauge were attached to the No. 16 wire left in the pipes; the No. 16 wire was then drawn out and the No. 11 wires drawn in for the entire length. To the end of this wire, in which a loop had been formed, were attached the several cables, the attachment being made by stripping the gutta-percha off the copper of each wire for some inches, care being taken to keep all the wires of the same length. The copper wires were then passed through the loop, bent back, twisted and secured. The whole of the ends were lapped over with tape and yarn to prevent abrasion. Before the wires were cut the numbers were put on. As the cables were made of six wires laid helically round the inner wire, it will be obvious that the wires, if numbered properly, would follow in succession. All the wires in the cables had been numbered and stamped at both ends from 1 to 6 on the outside—the center wire, No. 7, not being marked, so before the wires were cut, numbers marked on short pieces of lead tubing were slipped on the wires, care being taken that the numbers corresponded with the numbers stamped on the gutta-percha.

The cables when ready for drawing in were placed upon drums or swifts revolving on a stout frame, and at a convenient distance from the mouth of the pipe to avoid friction against the various points. Close to the mouth of the pipe was placed a wooden roller so as to prevent any friction against the edges of the pipe. At the opposite end of the box was placed a mat for the cables to touch instead of the ground, in order that no dirt might be carried in. Drawing-in cables in a straight length are begun at the center box, and the cable is first drawn through to *B* and then to *C* (figure 1.) In cases where there are two intermediate boxes, the drawing in is done once oftener. The cables are first drawn in from *A* to *C*, then the remainder from *A* to *b*, and again from *b* to *B* (figure 2.)

In the case of a still larger number of boxes, the drawing in has to be done still oftener. One-half of the cables are drawn through from *A* to *b*, and then from *b* to *B*, the other half being drawn through from *A* to *c*, and then from *c* to *C* (figure 3.)

When a break occurred in drawing in the cables, the wire was drawn out and laid along the trench to measure the distance of the break; the trench was

then opened, a pipe broken, and a wire threaded through the hauling in box, or, if the length was too great, a wire was threaded from the break and also from the box by looping the ends, and when sufficiently far through the wire was given a circular or twisting motion, when the looped or forked ends were almost sure to catch. The wires were then drawn out and attached to the broken wire of the cable.

After the cables have been drawn through one section of the pipes, they have to be drawn in to the opposite end, and to do this it is necessary to turn them over so as to bring the ends uppermost. The cables as they come out of the pipes are protected by a roller from any friction against the edge of the pipe, and then carefully coiled on to a sheet of canvas. They are then, preparatory to drawing in again, turned over by being coiled down on to the opposite side of the box on to canvas.

In the case of several intermediate boxes and a large number of wires, the drawing in the wires, and the drawing in and out, and the coiling and uncoiling of the cables, occupies a great length of time, which is much increased in the towns by the traffic and the inquisitiveness of the people.

GUTTA-PERCHA JOINTING.

Of the various operations connected with practical telegraphy, there is scarcely one of more importance or requiring more practice, skill and experience, than the making of a joint in a gutta-percha covered wire, and out door jointing particularly requires extraordinary skill and care.

In making joints in underground wires, the joint box is first opened, and the joiner's tool box placed close to one side of the hole. Attached to the box are two low stools for the joiner and his assistant to sit upon, to keep them clear from the wet pavement or damp ground. The box is opened, and the various tools, spirit lamps and furnace placed where most handy. The spirit lamp for the furnace is first lighted and the soldering iron heated; and the gutta-percha tools, if dirty or sticky with compound, are filed and cleaned. Great care is taken to keep the gutta-percha sheeting clean.

The wires leading in one direction are then taken out and prepared for jointing by stripping off the tape for about fifteen inches back and fastening the roll round the cable or wire by loosening the numbers and passing them down the wire to the tape, where it is fixed by gently squeezing it with the pliers on one side only, so that it binds evenly all round. When each wire has been served in this way the whole of them are cut to exactly the same length.

When this has been done on one side the joiner does the same to the wires leading the other way. The wires at both sides are then thoroughly cleaned with naphtha, until each wire becomes entirely clear from dirt and tar.

After cleaning the wires the joiner very carefully cleans his own hands and dries them well. A little naphtha cleans the hands better than anything else.

The wires are then ready for jointing. No. 1 wire is then taken up on both sides (it is best to begin with the lowest number and proceed in regular order) and the gutta-percha carefully trimmed off each end for about 1½ inches, care being taken that the knife does not "nick" the copper; when this does happen the copper is cut off at the "nick," and the percha trimmed back. The copper wire left bare is scraped carefully, so as to make it bright, and then the two ends being brought together and overlapping are held by the pliers, and first one side twisted, then the other. The double twist should appear as one uniform twist, perfectly regular, and take three turns each side, or about ½ inch in length; the surplus ends

are then cut carefully and close over, and, being lightly touched with the pliers, turned in, so as not to leave any edge sticking up above the twisted joints.

The twisted joints then soldered, care being taken to knock off any superfluous solder. Great care is taken when soldering a joint that no wires be immediately under it, as hot solder dropping on gutta-percha at once heats and penetrates it.

The remainder of the wires are then jointed and soldered. Great care is exercised in jointing similar wires; the jointer himself sees that the numbers correspond and does not trust to his assistant.

The gutta-percha jointing is then commenced and the second spirit lamp lighted for warming the material. The ends and soldered joint are first cleaned with naphtha, then a stick of compound warmed and a small quantity put on the joint and properly tooled over, so as to cover the joint equally. Before applying the tooling iron, it is carefully wiped.

The ends of the gutta-percha are then slightly warmed and the actual end nipped off with the fingers. One side of the percha is then well warmed for about 2 inches back, and then brought forward over the joint to the opposite side with a twisting motion by the moistened fingers; the opposite end, after heating, should then be brought forward over the other part in a similar manner as far as it will go, and the percha is again warmed and kneaded with the fingers and thumb.

After kneading, it is again warmed slightly with the spirit lamp. The compound is then heated and applied over the gutta-percha, by putting the compound stick on the percha, and rolling it along. The compound is warmed and applied a sufficient number of times to go thoroughly over the percha. The joint is again warmed and the compound properly tooled until it covers the joint uniformly.

A sheet of gutta-percha, well cleaned (the gutta-percha sheeting as supplied to jointers is cut into strips four inches long and kept carefully in a bag or case), is then warmed, and a piece of about one inch long cut off with a pair of scissors, whose edges are moistened against the lips. The joint is then warmed with the lamp and also the piece of sheet, which is then applied to one end of the joint, half an inch on the old core beyond the pull down, and being firmly pressed, is drawn along the length of the joint to an equal distance on the other side. The superfluous end is then cut off, the joint is next turned over and the spirit lamp applied so that the heat warms both the joint and the sheeting. The sheeting is pinched round the joint and slightly pulled so as to make adhesion better. The spare sheeting is then cut off with the moistened scissors close to the joint, and a warm tool passed over the seam so as to open it again, when it is again pinched up, thus forcing out any air that may be in it. In pinching up the last time one edge ought to overlap the other slightly, so that the warm tool may properly seal up the seam. By cutting off the sheet too far from the joint the seam cannot be re-opened, and by cutting off the sheet too close no seam is left, and there is necessarily a vacant space in the vacant covering; this is a frequent fault and should be avoided. By use of the tool, the ends of the coating are made to amalgamate with the old material. The joint is then warmed thoroughly and kneaded with the thumb and forefinger, care being taken to preserve its shape, and to knead evenly all around. It is then rubbed with the moistened hands.

The stick of compound and the joint are again warmed, and the compound is rolled over the joint from end to end. The joint is again warmed and the compound is worked and spread over it by means of the tooling iron, in an even and uniform manner.

The joint is again manipulated with the fingers, and then heated for the last time and rubbed well with the hand moistened. This rubbing must be done uniformly and equally all round. It tends to solidify the joint and gives it that highly polished and finished appearance so characteristic of the handiwork of a good jointer. The best thing found for moistening is saliva.

ANNUAL REPORT OF THE ITALIAN TELEGRAPHS FOR THE YEAR ENDING DECEMBER 31, 1872.

I.—Lines.

<i>Length of Lines in miles—</i>	
Government.....	11,541
Private Companies.....	546
Total.....	12,087

<i>Length of Wire in miles—</i>	
Government.....	84,904
Private Companies.....	7,889
Submarine Cable.....	110
Total.....	41,653

II.—Offices.

Government.....	891
Railroad or Private Companies.....	664
Total.....	1,485

Number of Offices with permanent service.....	18
" " with full day service.....	181
" " with limited service.....	673
Beside the 664 private offices.....	

III.—Apparatuses.

Morse's System.....	1,511
Other Systems.....	39
Total.....	1,550

IV.—Personnel.

Upper Employés and Central Administration.....	84
Number of Office Employés.....	1,909
Subaltern Personnel.....	1,586
Total.....	3,589

V.—Messages.

<i>Interior Service—</i>	
Sent over Government wires.....	3,108,200
Sent over private wires.....	90,082
Total.....	3,193,332
Government messages sent.....	147,730
Free (Service) messages sent.....	125,379
Total.....	273,109

<i>International—</i>	
Number of messages sent abroad.....	387,780
Total.....	3,904,101
Number of Messages received from abroad—	
Government wires.....	316,436
Private wires.....	115,634
Number of Messages passing in transit from one frontier to the other—	
Government wires.....	180,100
Private wires.....	22,154

VI.—Receipts.

Product of Home correspondence.....	\$326,758
Product of International correspondence.....	412,149
Sundry receipts.....	11,320
Total.....	\$1,268,587

Product of Governmental messages.....	254,373
Total.....	\$1,507,915

VII.—Expenses.

Construction of New Lines.....	\$121,285
Personnel.....	704,350
Maintenance of Lines and Offices.....	232,326
Semaphoric Service.....	32,225
Total.....	\$1,090,086

General Information.

Population of the State, according to census.....	26,801,154
Surface of the State in square miles.....	114,340

ANNUAL REPORT OF THE SWEDISH TELEGRAPHS FOR THE YEAR ENDING DECEMBER 31, 1872.

I.—Lines.

Length of lines in miles.....	4,652
Length of wire in miles.....	10,080

II.—Offices.

Government.....	143
Of railroad or private companies.....	186
Total.....	329

With permanent service.....	3
With full day service.....	48
With limited service.....	277
Total.....	328

III.—Apparatuses.

Morse's System.....	376
Other Systems.....	.....
Total.....	376

IV.—Personnel.

Upper Employés and Central Administration.....	20
Number of Office Employés.....	809
Subaltern Personnel.....	164
Total.....	493

V.—Messages.

<i>Interior Service—</i>	
Messages sent.....	491,515
Free messages sent.....	7,019
Total.....	498,534

<i>International Service—</i>	
Number of Messages sent abroad.....	112,732
Number of messages received from abroad.....	114,395
Number of messages passing in transit from one frontier to the other.....	62,601
Total.....	788,223

VI.—Receipts.

Product of Home Correspondence.....	\$150,586
Product of International Correspondence.....	116,621
Sundry Receipts.....	3,054
Total.....	\$270,261

VII.—Expenses.

Construction of New Lines.....	\$56,550
Personnel.....	143,321
Maintenance of Lines and Offices.....	54,091
Total.....	\$253,962

General Information.

Population of the State, according to census.....	4,204,177
Surface of the State in square miles.....	270,934

THE RUPTURE OF MAGNETIC NEEDLES.—M. Bouly.—A magnetized needle (of recently hardened steel) being broken in the middle, one or other of two cases may occur:—1. If the needle is so hardened as to break in the fingers like glass, the two halves are magnets, having the same magnetic moment; 2. If the steel is less hard, so that it is bent several times in opposite directions before breaking, the two halves have unequal magnetic moments, (and, it seems at first, arbitrarily so). Some experiments throw light on this difference. A soft needle, being pinched in the middle, and one half seized with the hand, bent backwards and forwards till rupture, the bent half is found with less magnetic moment than the other. A similar needle being seized with two pincers at two points very near the middle (and equally distant from it), and bent to and fro till rupture, the two halves show equal magnetic moments. It is inferred that rupture does not itself produce magnetic effect, independent of the separation, pure and simple, of the parts, at least so far as it is not accompanied with flexions affecting a finite portion of the broken needle. The author discusses three cases, rupture of saturated cylindrical needles perpendicularly to the axis; rupture of unsaturated cylindrical needles; rupture of saturated needles parallel to the axis. In the last case (prismatic bundles being first made up of strips of watch-spring, hardened and magnetized) the separated laminæ were found not saturated, and, what seemed strange at first, the sum of the magnetic moments of the separated laminæ was considerably greater than the magnetic moment of the original bundle. This the author will examine in a future note.

It is decided that the telegraph operators in Cuba are subject to the rigors of the military decrees while the present state of siege exists, the same as soldiers, but will have the rank and pay of officers.

CORRESPONDENCE.

HAS THE MAJORITY ANY RIGHTS?

To the Editor of the Journal of the Telegraph:

Of the operators and clerks on duty in the New York main operating rooms at noon, April 3d, there were 55 who did not chew tobacco and 34 who did.

Is it just that those so largely in majority should suffer from the disgusting habits of a few individuals who see fit to 'defile themselves with the weed'? Is it right that so many should be forced to sit day after day over spittoons from which an evaporation of filth is constantly rising to offend their nostrils and carry disease into their lungs, for no other reason than that a minority simply choose to indulge in a habit they themselves admit to be vile?

We are soon to occupy the new building. The floor is to be of tessellated marble. We shall doubtless have many visitors—ladies, distinguished gentlemen, and some of our own personal friends also. Let everything offensive to good taste be put out of sight.

Foreigners taunt us with being a nation of tobacco chewers. They say spittoons are inevitably present wherever they go—in our public places, steamboats, railroad cars, and even in our private parlors. Let us show them one place at least where this statement is not correct—a place not only elegant in its appointments but free from this everlasting and disgusting tobacco curse.

OPERATOR.

To the Editor of the Journal of the Telegraph:

The solution to Mr. Stoner's arithmetical problem in the JOURNAL of April 1st is as follows:

15
36
47
—
98
2
—
100

HORNEILLSVILLE.

LOS ANIMOS, Col. March 23, 1874.

To the Editor of the Journal of the Telegraph:

I think the suggestion of "S." in JOURNAL of March 15th, that a special press report rate be gotten up and given a place in the coming tariff book, covering our whole territory, a good one. I would further suggest that the book be made with a flush or index on the edge, giving abbreviations of States. To offices doing a good business this would save much valuable time now wasted in hunting up a certain State. The leaves would not be turned near as often as they are now. Consequently, the book would last much longer and be kept in a much better condition.

C.

ENFIELD, Iowa, March 23, 1874.

To the Editor of the Journal of the Telegraph:

I think a great majority of the check errors occur between offices within a radius of about 50 miles, some using "local" and others "square" rate, not knowing the distance. Especially is this the case where the distance is very close to either 25 or 50 miles. Having no means of ascertaining exact air line distance, sending office calls it 25 or 50 miles, or less, and receiving office computing distance at 27 or 52 miles, or more. To avoid errors arising from this cause, I would suggest something like this:

Amount of tolls to be transmitted with all messages; also, require checks of messages to be repeated back before O. K. is given.

I have not seen any suggestion that exactly covers this ground, and if you think it worthy of consideration, please make a note of it.

J. BARNES.

SWITZ CITY, Ind., March 19, 1874.

To the Editor of the Journal of the Telegraph:

This being a rainy day reminds me of the idea of placing a small pocket compass on the spools of the relay, which I adopted as suggested by the JOURNAL of the 1st inst. They cost only a trifle, and I would not, for the value of twenty compasses, lose the feeling of security which I now enjoy in this adaptation.

CHICK.

ATHOL, Mass., March 18, 1874.

To the Editor of the Journal of the Telegraph:

Agents for concerts, drummers, and others in like capacity, are continually presenting messages to be sent collect to their employers. I refuse them unless paid (and generally get it). They remark, "This is the first office that has refused to send them collect. Am I right or wrong? Please answer in JOURNAL."

OPERATOR.

Answer.—You are right in requiring such messages to be prepaid.

BROOKFIELD, Conn., April 2, 1874.

To the Editor of the Journal of the Telegraph:

Please give answer to this in next issue:

Suppose a transient person comes into office and wishes to send message collect. I inform him I cannot, he being a "transient." He says I will bring you responsible parties who will vouch for me as to responsibility. I say, "No; can't do it unless you pay for it." Would I be justified in so doing according to Rule 11 or any other rule? I hold I am bound in the interest of the Company to accept the message, as party will not send unless he sends collect.

MANAGER.

Answer.—The interest of the Company does not require you to receive messages to be collected upon without a sufficient guarantee. The proper guarantee is of the message and not of the responsibility of the sender.

KEY WEST, March 31, 1874.

To the Editor of the Journal of the Telegraph:

Does an application for leave of absence to a Government official—signed by an army officer, with his official title attached—come under the head of Government business? And can a manager refuse such a telegram at Government rate, if said officer gives his written certificate that his message is entitled to be sent at Government rate? By answering above questions, you will greatly oblige.

IN DOUBT.

Answer.—If the officer gives a written certificate that his message is entitled to be transmitted at the Government rate, the message should be accepted upon the conditions attached to such service.

MARCH 17, 1874.

To the Editor of the Journal of the Telegraph:

Does it take any length of time for a new wire to get charged with electricity, or can a message be transmitted on it as well as soon as it is strung?

G.

Answer.—It takes no perceptible time to charge a wire. Transmission of a message can at once be effected. A new wire generally works better than one which has for a long time been exposed to the weather.

To the Editor of the Journal of the Telegraph:

In a printing telegraph system possessing great capacity, would the fact that a dot is made between every word and two dots for a period be considered very objectionable?

G. W. H.

Answer.—It probably would not be considered very objectionable if counterbalanced by improvements over other printing systems.

NASHVILLE, April 3, 1874.

To the Editor of the Journal of the Telegraph:

A well known responsible party offers us a message which he pays for. It requires an answer, but he says he will not pay for the answer. Could we refuse to send his message unless he guaranteed payment of the answer?

It would be consistent with Rule 12 for us to do so, but it seems to me that if the party was to decline to make the guarantee, but insist on us sending his message, tendering us the tariff on it, we could not refuse it without rendering the Company liable for damage. This issue will arise with one of our customers very soon on a number of messages, and, in the absence of positive authority to do otherwise, I think it prudent not to refuse to forward his messages. Could we enforce Rule No. 12. If a party offers a message and tenders the price, can we legally make any other condition, to be determined by what he might happen to say in such message?

Answer.—You cannot legally enforce the prepayment of an expected answer, but in all cases it should be asked. In the case first referred to, it would be proper for a service message to accompany the dispatch, notifying the office of delivery to require prepayment of an answer. It would be well also to notify the office by postal card for permanent reference. With regard to Rule 12, a reasonable person in requesting the Company (as he virtually does) to accord him a favor in transmitting a return message without requiring prepayment from the sender, would probably not object to guaranteeing the Company against possible loss of remuneration for its work. Should, however, the guarantee be refused, the message should be accepted and the office of delivery be notified as in the first case.

To the Editor of the Journal of the Telegraph:

A great many operators know very little of the science of their work, but would like to understand it better. They read and wonder over learned articles in the JOURNAL about Resistances, Electrodes, Galvanometers, Ohms, &c., &c., but know nothing about them. If you would publish a series of papers beginning at the bottom, and teach us about these things, it would improve more than half of the W. U. force.

OPERATOR.

There are several works extant containing all the rudimentary information desired by our correspondent. Their cost is trifling, and as this knowledge is absolutely necessary to the telegraphist who expects to hold a position of even minor importance, to say nothing of progressive advancement, self-interest should dictate its acquirement. It is our design, however, for the benefit of that class for whom our correspondent speaks, to publish from time to time such descriptive articles, selected from approved authors, as will afford much aid in the comprehension of the higher grades of information and instruction contained in the JOURNAL.—(ED.)

To the Editor of the Journal of the Telegraph:

A man gets off the train, writes a message for me to send, and gets back on the train; the train starts off before I had time to see his frank, and he tells me, as he goes off, "Send it, I have a frank." Should I take his word for it, or should I refuse to send it? Please answer in the next JOURNAL.

BEGINNER.

Answer.—The message should not be transmitted. Rule 42 provides that in all cases where messages are presented to be sent free on account of frank, the franks must be shown, and the message examined to see that they come within the limitations of such franks.

To the Editor of the Journal of the Telegraph:

At a great many small railroad offices the Station Agent is the Manager, but the baggage master, or his assistant, or clerk, are operators, doing perhaps nearly all the work and making out the reports, &c. Have these clerks and baggage masters any right to send urgent private telegrams on their own private business, D. H., with check? W. C. G.

Answer.—Messages of this character must be approved by the Manager of an office before being sent. He is expected to exercise great discretion in the matter, and is responsible for messages improperly sent free.

Nick.—You will find the International Morse Alphabet in the JOURNAL of April 1st, 1873. By comparing it with the American Alphabet the difference will at once be seen.

Cope.—The deposit upon the copper plate of a Daniell's cell is copper in the purest state. It is valuable, and is chiefly used to alloy gold in manufactures.

O. H. D.—For a position as operator in California apply to Mr. James Gamble, General Superintendent, San Francisco. All parts of the State are considered healthy, and the Southern portion particularly salubrious. The salaries paid there are proportionately the same as in other sections of the country.

W. T. W.—There are twelve words in "Send me barrel each, X, XX and XXX ale."

J. P. Beers.—Thanks for your favor.

TELEGRAPHIC MONSTERS.

The Indo-European Telegraph Company appear to be just now contending with the same difficulties which the early days of electric telegraphy experienced in America, when the ingenuity of the Press Association in that country invented a "code" by which a very large amount of information was conveyed in a very small compass respecting the markets and proceedings in Congress, at a very small cost to themselves, and a serious diminution of profits to the Company. The Indian Government, in order to prevent what they consider of the nature of a fraud on them, have published a list of compound words that they say must be paid for at a higher rate. It certainly does seem hard that a telegraph company should have to take on their line such words as "fireinsurancepolicy," "foradvertisment," "powerattorney," "royalfamily," "wireanswer," "marriage treaty." There are many other words in the code which evidently do not convey the meaning that they appear to imply; such for instance as "lanternjaws." We are afraid, however, that as long as the rates remain at the present high figure it will be useless for the Government to contend against the ingenuity of "code makers." In America, where the system of "coding" was endeavored to be put down, telegraph managers went so far as to declare that every word of more than five letters should be charged at an extra rate. A few weeks, however, only elapsed before an amended "code" was prepared, in which no word was to be found with more than five letters. Again an edict went forth that no word should have more than four letters; the Press Association was equal to the emergency, and a new code was quickly made in which every word was within the stipulated limit. A third attack followed, and the number of letters in the code words was limited to three. Finding the contest with so powerful a body unsuccessful, a new and more liberal system was adopted; reduced rates were given for the press messages, and from that time may be dated that enormous expansion of the telegraphic system which has grown up in America and in this country.—*Railway News.*

THE DEPOSITION OF METALS BY THE MAGNETO-ELECTRO CURRENT.

During the past few years much interest has been felt in the perfection of electro-magnetic machines, of which several are now before the public, all claiming to be cheaper and better for the use of electroplaters than the best of the batteries now generally employed. The largest of those exhibited at the Vienna Exposition, requiring a three-horse power engine to drive it at its regular speed of 400 revolutions per minute, generates a current sufficient to raise to a red heat, and even to fuse, a rod of iron four-tenths of an inch in thickness and $4\frac{1}{2}$ feet long, and the amount of light it will produce is equal to 250 carcel burners. The cost of keeping such a machine in repair is very small; it is always in order for work, and the daily expenses of running it are considerably less than the cost of maintaining a battery power of equal intensity.

Probably the best machine of this kind yet invented is the Gramme machine, which affords a striking instance of the conservation of force, inasmuch as a large proportion of the power expended is converted into kinetic energy. A secondary battery may be charged with it as readily as with a galvanic battery. The time required to charge fifteen or twenty elements does not exceed a few minutes, and the effects obtained by the accumulated chemical action considerably surpass in intensity—though not in duration, as they last only so long as the battery requires to discharge itself—those produced by the current of the machine. This may be verified by many experiments, most readily by the incandescence of a platinum wire.

The Gramme machine is quite a recent invention, having been patented in 1860, and first submitted to the Academie des Sciences in June, 1871. The current is absolutely continuous, and uniformly in the same direction; its strength may be augmented or decreased by varying the rapidity with which the armatures are made to rotate; and the generation of heat in the bobbins may be avoided by so regulating the driving power that the exterior resistance shall be equal to, or greater than, the interior resistance. This is a valuable feature, as a large percentage of the power expended may be converted into electricity.

There is nothing delicate in the construction of this machine; it contains no element capable of easily presenting an opposing electro-motive force; and in case of a derangement, it can be put in working order by any mechanic of average intelligence. The wire coiled around the fixed electro-magnets weighs 270 lbs; that around the two circular armatures 80 lbs; the whole machine 920 lbs. The normal speed is about 800 revolutions per minute, and this may be attained by a one-horse power. The tension of the current is equal to that of two Bunsen elements, and the quantity equals that of thirty-two. This machine has been tried in the extensive works of MM. Christoffe & Co., Paris, and the results obtained have been entirely satisfactory. We give the details of these experiments, made with a machine which has been in operation for more than a year, and has not required any alterations or repairs whatever.

Total Deposit.	Time.	Surface of Anode.	Deposit per hour.	Speed.
oz.	h. min.	sq. ft.	oz.	rev.
209.05	7 50	57.62	23.81	300
206.67	7 50	57.62	26.49	
209.02	7 50	57.62	26.81	
214.09	7 50	57.62	27.44	300
69.30	2 50	38.41	24.74	
69.47	2 45	38.41	25.27	
70.49	2 45	38.41	25.62	300
54.50	2 35	28.81	21.10	
55.75	2 45	28.81	20.33	
53.90	2 40	28.81	20.23	

Smaller machines than that employed in the experiments above recorded have been made, which will answer very well when a strong current is not required. In these, steel armatures are employed in place of the electro-magnets. We believe that the machines of Gramme, Wilde, Siemens, Holske, and other inventors, have been tested in some of the large electro-plating establishments in this and neighboring cities with very good results.—*Metal Worker.*

NICKEL PLATING.

The following description of the usual process is given by Prof. Sharples, in a recent number of the *Boston Journal of Chemistry*:

"The double sulphate of nickel and ammonium, which is the salt that is generally used, may now be had in commerce almost pure. It is manufactured on a large scale by Joseph Wharton, of Camden, N. J., who controls the nickel market in this country. Cast nickel plates for anodes may be obtained from the same source. The anodes should considerably exceed in size the articles to be covered with nickel. Any common form of battery may be used. Three Daniell's or Smee's cells, or two Bunsen's connected for intensity, will be found to be sufficient. The battery power must not be too strong, or the deposited nickel will be black. A strong solution of the sulphate is made and placed in any suitable vessel; a glazed stone ware pot answers very well if the articles to be covered are small. Across the top of this are placed two heavy copper wires, to one of which the articles to be covered are suspended, to the other the anode. The wire leading from the zinc of the battery must then be connected with the wire from which the articles are suspended, the other wire being connected with the anode."

In order to prepare the articles for coating, they must be well cleaned by first scrubbing them with caustic soda or potash, to remove any grease, and then dipping them for an instant in aqua regia and afterward washing thoroughly with water, taking care that the hand does not come in contact with any part of them. This is accomplished by fastening a flexible copper wire around them, and handling them by means of it. The wire serves afterward to suspend them in the bath.

If the articles are made of iron or steel they must be first covered with a thin coat of copper. This is best done by the cyanide bath, which is prepared by dissolving precipitated oxide of copper in cyanide of potassium. A copper plate is used as an anode. After they are removed from the copper bath they must be washed quickly with water and placed in the nickel bath; if allowed to dry or become tarnished the nickel will not adhere. Great care must be used through the whole process to keep all grease, dust or other dirt from the articles to be covered, or else the result will be unsatisfactory."

ON THE CHANGE OF ELASTICITY AND LENGTH IN A WIRE TRAVERSED BY A GALVANIC CURRENT.—*Dr. H. Streintz.*—The results of this inquiry are thus summed up:

- (1.) The galvanic current works a change in the elasticity of the conducting wire only through the heat produced.
- (2.) The current expands the wire more than a heating to the same temperature would; only in the case of hard steel there is no such difference.
- (3.) The galvanic expansion occurs, on closing of the current, not suddenly but gradually, like expansion by heat.
- (4.) It cannot be the result of an electro-dynamic repulsion, but probably consists in a polarization of the heat vibrations produced.

TARIFF BUREAU.

SEMI-MONTHLY CIRCULAR.

EXECUTIVE OFFICE,
WESTERN UNION TELEGRAPH COMPANY,
145 BROADWAY, NEW YORK.
April 15, 1874.

To all Offices on W. U. Lines:

The following changes and additions have been made since the date of the last circular:

GENERAL INFORMATION.

Gilman, Ala., should read Gilmer.
Pelham, Ala., closed.
Pensacola Junc., Ala., changed to Whiting.
Tulare, Cal., is now a W. U. office; erase other line tariff.
Canterbury, Del., closed.
Blackshear, Ga., re-opened, square 187.
Lawton, Ga., changed to Dupont.
The P. O. A. of 358, Bluff City, Ill., is *Bluffs, Scott Co.*
Mansfield, Ill., re-opened, square 327.
Pike, Ill., closed.
Brown's Valley, Ind., closed.
Lisbon, Me., closed.
East Abington, Mass., changed to Rockland.
Richmond and Lexington Junction, Mo., changed to Lexington Junction.

Hereafter the "tariff for other lines," from Plattsmouth to offices on the B. and M. R. R. line in Nebraska, will be as follows:

Beatrice.....	60	4	Grafton.....	60	4
Crete.....	40	3	Harvard.....	65	4
Dorchester.....	50	3	Junata.....	70	5
De Witt.....	50	3	Lowell.....	75	5
Exeter.....	60	4	Waverly.....	35	2
Fairmont.....	60	4			

The office at Weehawken, N. J., is not open for commercial business after 6 o'clock P. M.

Gorham, N. Y., changed to Stanley.

Pond Eddy, N. Y., is an other line office; "tariff for other lines," 20 and 2 from Rondout, N. Y., and Scranton and Honesdale, Pa.

Birdsboro, Pa., closed.

140 Fullerton, Clarion Co., Pa., closed.

Yatesville, Schuylkill Co., Pa., closed.

Glen Carbon, Pa., closed.

Business for 140 Harrisville, Pa., should be checked direct.

Oakwood, Texas, closed.

NEW OFFICES.

205 Calhoun, Ala.			
305 Whiting, "			
Riverside, Cal.			
* Woodbury, Conn.,	25	2	27 Waterbury, Conn.
208 Dupont, Ga.			
308 Bismarck, Ill.			
307 Danby, Ill.			
317 Nevada, "			
231 New Market, Ind.			
417 Lucas, Iowa.			
264 Loretto, Ky.			
21 Melrose, Mass.			
18 Rockland, "			
* Acapulco,	Mex.	600	55 5:9 Brownsville, Texas.
* Chila,	"	560	51 5:9 "
* Cunducan,	"	630	56 5:9 "
* Dos Caminos,	"	560	51 5:9 "
* Frontera,	"	720	61 5:9 "
* Hato de Oro,	"	650	54 5:9 "
* Huimanguillo,	"	665	55 5:9 "
* Mo'oican,	"	630	51 5:9 "
* San Juan Bautista,	"	730	63 5:9 "
* San Jose del Carmen	"	630	51 5:9 "
437 Lexington Junc., Mo.			
* Bellvue, Neb.		35	2 474 Plattsmouth
* Friendville, "		50	3 474 "
* Greenwood, "		35	2 474 "
* Sutton, "		60	4 474 "
* Wilber, "		50	3 474 "
53 Still Valley, N. J.			
* Stanley, N. Y.		35	2 93 Canandaigua.
5 Bedford, N. S.			
5 Grand Pre, N. S.			
297 Burr Oak, Wis.			

In JOURNAL of February 15th, 1874, an order was published directing that on and after March 1st, the tariff for other lines to La Crosse, Wis., and certain other points on N. W. Co's. lines would be that printed in the tariff book. As this order changed the rate from many offices to La Crosse, it should be observed by such offices that, to the following points in Minn.,

the rate formerly obtained by adding the other line tariff to the rate to La Crosse is also changed by the same order:

Albert Lea,	Oakland,
Alden,	Rushford,
Brownedale,	Spring Valley,
Delavan,	Wells,
Fountain,	Whelan,
Grand Meadow,	Winnebago City,
Hokah,	Ishnour,
Houston,	Hayward's,
Lanesboro'	Wykoff.

CUBA CABLE BUSINESS.

We are notified that communication by cable between Havana and Santiago, and between Trinidad and Demerara is now restored.

WILLIAM ORTON, President.

TRANSFER SERVICE.

CORRECTION.

In list of Money Order Offices, dated March 1st, 1874, for Greensburg, Pa., read Greensburg, Pa.

INFORMATION WANTED.

Information is wanted by Robert Holmes, No. 55 High street, Albany, N. Y., of the whereabouts of Philip P. Van Rensselaer, telegraph operator. He is supposed to be in the employ of the Western Union or of the Atlantic and Pacific Company.

Any information concerning Wm. H. Auston, telegraph operator, 20 years of age, a native of San Francisco, would be gratefully received by his mother. He was lately employed in a telegraph office at Omaha, Nebraska. Address Joseph B. Auston, Lock Box No. 1463, San Francisco, Cal.

ACTION OF CINCINNATI TELEGRAPHERS ON THE DEATH OF GEORGE H. EVERETT.

CINCINNATI, O., March 26, 1874.

At a meeting of the operators of the Western Union Telegraph Co., held March 26, at their office in this city, the following resolutions were unanimously adopted:

Whereas, God, in his infinite wisdom, has taken from amongst us Geo. H. Everett, our former fellow operator,

Resolved, That in his death we feel the loss of a genial companion and a warm and faithful friend.

Resolved, That his abilities had placed him high in his profession, and that the fraternity have lost an able cooperator.

Resolved, That we deeply sympathize with the family of the deceased in their affliction, and that a copy of these resolutions be sent to them, and also to the newspapers of this city, and the telegraphic journals, for publication.

BORN.

BAILEY.—At Santa Cruz, Cal., Feb. 24, 1874, to J. K. Bailey, Messenger W. U. Tel. Office, formerly of L'Anse, Mich., a son.

CARPENTER.—At Millsboro Depot, Va., April 3, 1874, to Charles F. Carpenter, Manager W. U. Tel. Office, a daughter.

FITZGERALD.—At Watertown, Mass., April 2, 1874, to D. W. Fitzgerald, Manager W. U. Tel. Office, a daughter.

SMITH.—At Baltimore, Md., April 4, 1874, to R. H. Smith, Manager Automatic Telegraph Office, a daughter.

MARRIED.

BRAWLEY-HIGGINS.—On Wednesday, March 4, 1874, at the residence of the bride's parents, Eliza T. Brawley, Manager W. U. Tel. Office, Peru, Ill., to Miss Sarah E. Higgins, daughter of Levi and Martha Higgins of Orion, Ill.

HEWLETT-CHENEY.—At Montgomery, Ala., on the evening of March 19, by Rev. D. W. Gwin, T. I. Hewlett, and Miss M. L. Cheney, daughter of Capt. J. M. Cheney.

MACLELLAN-SYMONDS.—At Tracadie, N. S., Feb. 11, 1874, by Rev. G. C. Metzler, Frederick MacLellan to Laura E. Symonds, operator at Little Tracadie, N. S.

DIED.

BERRY.—At Phillipsburg, N. J., March 23, 1874, of consumption, Harriet C., wife of Charles Berry, lineman W. U. Tel. Co., aged 27 years, 8 months and 27 days.

SHARRARD.—At Paris, Ky., April 3, 1874, of consumption, in the 23d year of his age, Wm. T. Sharrard, late operator for M. & L. R. R.

THE TELEGRAPHERS' MUTUAL BENEFIT ASSOCIATION.

ACKNOWLEDGMENT OF RECEIPTS FOR ASSESSMENTS NOS. 55, 56 AND 57, UP TO AND INCLUDING APRIL 18, 1874.

17, 19, 22, 27, 31, 33, 51, 53, 59, 64, 98, 100, 131, 136, 138, 139, 141, 143, 144, 153, 154, 156, 158, 160, 164, 169, 171, 181, 182, 185, 186, 187, 206, 227, 230, 232, 237, 238, 242, 244, 248, 252, 258, 271, 273, 280, 288, 294, 303, 316, 319, 323, 328, 341, 341, 341, 347, 357, 360, 362, 364, 366, 371, 376, 379, 383, 394, 398, 411, 412, 418, 423, 423, 430, 431, 434, 441, 451, 453, 455, 457, 461, 462, 490, 495, 497, 499, 500, 508, 504, 505, 506, 507, 508, 535, 537, 555, 556, 557, 565, 566, 573, 575, 584, 588, 597, 605, 618, 636, 648, 649, 655, 670, 671, 680, 692, 694, 695, 697, 701, 708, 705, 710, 712, 717, 722, 723, 724, 736, 738, 738, 737, 750, 751, 756, 758, 766, 780, 781, 7-2, 788, 7-5, 788, 790, 791, 803, 804, 809, 812, 823, 835, 831, 836, 838, 841, 842, 855, 869, 871, 874, 875, 876, 897, 8-9, 904, 906, 908, 916, 926, 930, 931, 932, 934, 944, 949, 954, 956, 957, 959, 960, 968, 964, 979, 980, 1000, 1002, 1009, 1014, 1016, 1026, 1030, 1031, 1033, 1084, 1088, 1041, 1046, 1050, 1057, 1063, 1069, 1071, 1072, 1080, 1099, 1108, 1104, 1105, 1106, 1107, 1108, 1109, 1110, 1112, 1113, 1115, 1117, 1119, 1120, 1121, 1122, 1123, 1125, 1131, 1131, 1135, 1136, 1139, 1141, 1153, 1169, 1183, 1190, 1191, 1193, 1194, 1195, 1198, 1207, 1211, 1217, 1221, 1226, 1227, 1234, 1235, 1243, 1255, 1256, 1263, 1269, 1273, 1271, 1275, 1279, 1281, 1283, 1284, 1285, 1286, 1290, 1293, 1295, 1339, 1340, 1342, 1344, 1346, 1348, 1349, 1350, 1351, 1353, 1356, 1371, 1373, 1386, 1400, 1405, 1406, 1415, 1421, 1427, 1428, 1431, 1433, 1434, 1444, 1450, 1457, 1458, 1465, 1469, 1470, 1471, 1474, 1475, 1478, 1481, 1483, 1490, 1495, 1496, 1497, 1498, 1503, 1508, 1504, 1505, 1512, 1514, 1515, 1516, 1519, 1528, 1529, 1530, 1531, 1533, 1537, 1543, 1553, 1556, 1557, 1558, 1559, 1562, 1563, 1570, 1573, 1576, 1582, 1583, 1596, 1597, 1601, 1608, 1604, 1605, 1603, 1609, 1610, 1611, 1612, 1613, 1616, 1619, 1625, 1629, 1639, 1641, 1646, 1649, 1650, 1653, 1655, 1657, 1666, 1667, 1-69, 1670, 1673, 1676, 1677, 1680, 1681, 1682, 1684, 1687, 1688, 1689, 1690, 1696, 1700, 1701, 1702, 1704, 1707, 1708, 1709, 1710, 1712, 1713, 1715, 1716, 1718, 1719, 1720, 1721, 1723, 1728, 1734, 1736, 1737, 1738, 1743, 1747, 1749, 1748, 1745, 1746, 1747, 1750, 1751, 1753, 1754, 1755, 1756, 1757, 1758, 1759, 1760, 1765, 1766, 1767, 1768, 1769, 1771, 1772, 1773, 1775, 1777, 1778, 1785, 1786, 1788, 1789, 1791, 1803, 1807, 1810, 1814, 1828, 1830, 1837, 1838, 1839, 1840, 1841, 1847, 1854, 1857, 1758, 1859, 1860, 1863, 1861, 1874, 1877, 1886, 1889, 1895, 1896, 1897, 1915, 1916, 1929, 1931, 1933, 1939, 1941, 1943, 1945, 1946, 1947, 1958, 1964, 19-9, 1973, 1973, 1974, 1975, 1976, 1985, 1986, 1991, 1992, 1993, 1995, 2004, 2007, 2010, 2012, 2023, 2023, 2024, 2027, 2040, 2041, 2045, 2048, 2053, 2056, 2060, 2061, 2063, 2064, 2066, 2073, 2079, 2081, 2085, 2092, 2096, 2098, 2105, 2106, 2108, 2110, 2112, 2115, 21-8, 2129, 2130, 2133, 2134, 2137, 2139, 2146, 2148, 2150, 2151, 2156, 2157, 2159, 2163, 2168, 2171, 2175, 2176, 2177, 2180, 2182, 2183, 2184, 2185, 2189.

ACKNOWLEDGEMENT OF RECEIPTS FOR ASSESSMENTS NOS. 58, 59 AND 60 UP TO AND INCLUDING APRIL 18, 1874.

16, 17, 19, 25, 37, 46, 50, 52, 53, 54, 56, 59, 60, 61, 64, 67, 77, 86, 88, 91, 95, 97, 99, 100, 113, 121, 129, 133, 134, 138, 145, 157, 176, 177, 181, 201, 202, 217, 218, 223, 228, 244, 245, 257, 267, 269, 276, 278, 279, 281, 283, 285, 285, 296, 301, 312, 319, 349, 353, 381, 387, 378, 383, 385, 394, 406, 411, 416, 425, 436, 434, 438, 456, 463, 464, 467, 478, 509, 510, 520, 526, 533, 533, 536, 546, 547, 548, 549, 564, 576, 577, 579, 587, 594, 603, 613, 626, 656, 661, 670, 672, 675, 680, 708, 715, 721, 723, 731, 734, 740, 772, 799, 813, 815, 821, 825, 833, 875, 896, 911, 989, 995, 1001, 1009, 1011, 1013, 1023, 1024, 1039, 1064, 1065, 1061, 1081, 1083, 1090, 1136, 1143, 1144, 1145, 1173, 1175, 1183, 1195, 1198, 1199, 1200, 1203, 1213, 1223, 1245, 1251, 1252, 1259, 1260, 1276, 1290, 1291, 1300, 1306, 1323, 1329, 1333, 1354, 1355, 1356, 1359, 1364, 1365, 1368, 1371, 1376, 1394, 1398, 1402, 1403, 1404, 1407, 1410, 1412, 1440, 1444, 1448, 1451, 1453, 1454, 1455, 1456, 1463, 1506, 1507, 1516, 1517, 1518, 1519, 1522, 1550, 1560, 1568, 1571, 1589, 1590, 1615, 1624, 1635, 1658, 1695, 1723, 1735, 1736, 1743, 1763, 1790, 1809, 1811, 1812, 1817, 1831, 1869, 1874, 1-77, 1882, 1894, 1906, 1911, 1913, 1914, 1919, 1932, 1944, 1946, 1947, 1958, 1965, 1970, 1991, 1995, 1999, 2000, 2001, 2005, 2019, 2020, 2021, 2028, 2029, 2030, 2035, 2036, 2044, 2048, 2049, 2050, 2059, 2063, 2066, 2-97, 2099, 2103, 2118, 2120, 2129, 2133, 2135, 2164, 2172, 2174, 2178, 2186, 2190, 2194, 2201.

NOS. 53 AND 54.

98, 237, 496, 1069, 1256, 1916, 1939, 1911.

MISCELLANEOUS.

53.—496, 1917.

54.—1039.

58.—533, 825, 1742, 1874, 1933, 2119, 2130, 2139, 2163, 2175, 2176, 59.—533, 1874, 1933, 2119, 2139.

MR. W. N. EASTABROOK has been appointed Division Operator and Assistant Train Master of the Elmira and Canandaigua Divisions of the Northern Central Railway Company. Headquarters at Elmira, N. Y.

CUBA SUBMARINE TELEGRAPH.

The report states that the gross receipts for the half year, including the balance from last year's account, amount to £6,349; expenses (including £147 paid for income-tax) amount to £2,065, leaving a balance of £4,283 for the half year. It will be observed, upon comparing these receipts with those of the previous year, that the present account shows a considerable falling off. This result is owing to the fact that the Company's cable ceased to work at the end of October. The steamship *Suffolk*, as explained in last report, not being available for the repair of the cable, the Directors immediately invited tenders from all the telegraph construction companies for this work, and considered themselves fortunate in securing the services of the Telegraph Construction and Maintenance Company. That Company, in the early part of December, despatched the steamship *Investigator*, which arrived at Cuba on the 20th January; but although the Directors have heard of the repair of a portion of the cable, they regret to say that up to this moment they have not yet heard of the work being completed. They are now, however, in hopes of hearing from day to day that such has been the case. The heavy expenses connected with the repair of the cable will, it is feared, involve the Company in questions with the West India Company, at whose suggestion this Company subscribed the sum of £3,000 towards the purchase and fitting out of the steamship *Suffolk*, and laid aside a further sum of £1,000 towards her maintenance, on which outlay they have received no return. As stated above, the vessel has not been available when required, and the Directors have thus been compelled to adopt a course which involves a much greater cost and delay in effecting the repair than would otherwise have been the case. The Directors do not, therefore, recommend any interim dividend, inasmuch as they are as yet unable to state what expenses the Company will be put to for these repairs. Under these circumstances they propose to carry the whole amount of £4,283 to the reserve fund specially applicable to the payment of these expenses. The Directors have received, in common with the other shareholders, circulars from Mr. William Abbott and Captain Gandy with reference to the amalgamation or lease of this Company to the West India Company. They have not, however, had any personal communication with either of these gentlemen on the subject, nor have they received any communication from the West India Company thereon. Under these circumstances they have considered it the wisest course to take no action in the matter.

The report of the Directors of the Mediterranean Extension Telegraph Company to the shareholders stated that the traffic for the entire year was slightly in excess of that for 1872, and it would be seen that the amount claimed under the guarantee was not so large as for the preceding half year. The cables and land lines were all in good working order, and the cost of maintenance had been small. The Directors proposed to recommend payment of the usual dividend of 8 per cent. preference shares of the Company, and of a dividend at the rate of 3 per cent. per annum on the ordinary share capital, payable on and after the 17th instant., leaving £491 to be carried to the reserve, which would then amount to £6,256. In answer to a question of a shareholder at the half-yearly meeting the Chairman stated that the negotiation with the Eastern Telegraph Company for a consolidation had fallen through, and the proposal had been withdrawn. The dividends recommended were declared.

THE CONTRACT FOR THE PANAMA AND PAYTA CABLE.

The Panama correspondent of the *New York Herald* writes, under date of March 22d, in regard to the contract for the submarine telegraph cable between Panama and Payta, that the Peruvian Government has just entered into a contract with Mr. Donald Cruikshank, the agent of the Telegraph Maintenance Company of London, to lay a cable between Panama and Payta, the Peruvian Government pledging itself to get the consent of the United States of Colombia, and a similar privilege for the enterprise to that to be enjoyed while running through Peruvian territory. After the contract had been signed it was discovered that, some weeks before, the Foreign Office in Peru had been informed that Colombia conceded the privilege desired, on condition that the cable should not only connect Panama and Payta, but should go out of its straight course and touch in at Buenaventura, another port in Colombia. Mr. Cruikshank would have nothing more to do with the affair, and is here on his way home to report to his Company.

The Hooper Telegraph Works have received a certificate from the engineers of the Western Brazilian Telegraph Company, Sir William Thomson and Professor Fleeming Jenkin, that the cables of that Company from Pernambuco to Rio Janeiro have been successfully laid, and have answered the tests for the stipulated period after submersion. The portion of cable from Para to Pernambuco having been previously certified, the Hooper Company has now completed the contract, and telegraphic communication along the indicated portion of the South American coast is permanently established.

The Brazilian Submarine Telegraph Cable Expedition left Madeira on the 28th ultimo for St. Vincent, Cape Verd, and it is presumed the cable will by this time be successfully laid. Any messages addressed to Charles R. Blandy, of Madeira, by the African or other steamers leaving England, will be at once sent forward to St. Vincent, whence they will go on by steamer to South America.

The receipts of the Eastern Extension, Australian and China Telegraph Company, for the month of February, amounted to £17,706 against £18,085 in the corresponding period of 1873, from the four separate lines, viz: The British Indian Extension, China, Submarine, British Australian, and the Victoria and Tasmanian Telegraph.

The receipts of the Submarine Telegraph Company for the month of February, amounted to £7,800 against £7,616 for the corresponding month of 1873.

EXPERIMENTS ON THE ELECTRIC STATE OF CONDUCTORS ON THE ITALIAN LINES.—Some new regulations have lately come into force, according to which the inspectors of stations are required to examine once a month the conductivity and insulation of lines terminating at their stations or passing through them, and to report to the departmental directors, who forward a copy (of the report) to the general direction. The data thus collected are compared by the latter with the conditions of a line in the normal state, and with psychometric and thermometric changes, and the result is shown in graphic curves. The testing experiments are made with a galvanometer having 1000 turns of wire, with whatever rheostat the inspector may have, and with a battery of 50 Bunsen elements. The mode of interpreting the indications is fully explained.

THE SIGNAL SERVICE LINE ON THE COAST OF NORTH CAROLINA.

Under date of April 9th the *Tribune* publishes a dispatch from Norfolk, Va., which states that the Signal Service telegraph, the first pole of which was set in that city on Friday, Nov. 28, 1873, has just been completed between Norfolk and Cape Hatteras. The entire distance traversed between Cape Henry and Cape Hatteras lights, along the indentations of the coast, was 125 miles. The line extends along the coast at an average distance of 150 yards above the limits of the surf. Two inlets had to be spanned with cable, namely, Oregon Inlet, 973½ yards wide, and New Inlet, 750 yards wide. Between the two inlets lies Body's Island, eight miles wide. Signal and life-saving stations are in process of erection, or marked out, going south from Cape Henry, at Kitty Hawk, Body's Island, Chickamacomico, and Kenekut. Others will be established, but their locations have not yet been decided upon. As a proof of the immense value the stations will be to the commercial interests of the country, James H. Bigbee, who commanded the expedition, said he counted over 100 wrecked vessels of all classes along the coast, and learned that in numerous instances the entire crew was lost. These were not all recent wrecks, but they illustrate the terrors of this dangerous coast, along which the Signal Service Bureau will soon have stretched a chain of signal and life-saving stations, which will be the means of rescuing many lives and reclaiming merchandise of great value.

PACIFIC OCEAN DEEP SEA SOUNDINGS.

At a recent meeting of the California Academy of Sciences, Professor Davidson announced some of the results of the soundings made by Captain George T. Belknap, of the United States steamer *Tuscarora*, during last year, with reference to the projected laying of a telegraphic cable from this coast to Japan. This work had accomplished a remarkable development of the depths of the Pacific Ocean, which had no parallel in the plateaus of the Atlantic. The *Tuscarora* first started in her line of soundings from the entrance to the Straits of Fuca, across that portion of the North Pacific designated as the Gulf of Alaska, toward the Asiatic coast. After leaving the entrance to the straits, the bottom slopes gradually to a depth of 100 fathoms, and then a sudden descent occurs, which reaches a depth of 1,400 fathoms, at a distance of 150 miles from the coast. The temperature of the water at the greatest depth on this line of survey was 34 degrees.

Commander Belknap then returned, prosecuting off and on soundings all along the coast to the entrance of San Francisco Bay. This work determined the fact that the sudden descent at the bottom of the Pacific to a great depth is continuous down the entire coast, varying from twenty to seventy miles out. In the latitude of San Francisco Bay, the great bench is reached a short distance off the Farallones, where the bottom suddenly descends to a depth of two miles. Off Cape Foulweather, the bottom descends precipitately from 400 fathoms to a depth of 1,500 fathoms, and then the plateau continues westward for hundreds of miles, and comparatively as level as a billiard table. Off Cape Mendocino, where shoals have been erroneously supposed to exist, from the seaward jutting of the mountains, a depth of 2,200 fathoms is reached eighty miles from the shore. Thirty miles off the Golden Gate, the bottom is reached at 100 fathoms; at 55 miles, it has descended to 1,700 fathoms; and 100 miles out, the enormous depth of 2,548 fathoms has been measured without reaching bottom.

Journal of the Telegraph.

This Journal is issued on the 1st and 15th of each month. Its circulation is over 8,000. It goes to every State, Territory and Province on the Continent. It has become a necessity, and is always welcomed as a friend. No better medium for advertising exists.

TERMS:

TWO DOLLARS PER ANNUM IN ADVANCE.

Address—

JOURNAL OF THE TELEGRAPH,

Western Union Telegraph Company,
145 Broadway, New York.

NEW YORK, APRIL 15, 1874.

ERRORS IN OTHER LINE CHECKS.

There are no errors more numerous than those arising from improper checks on messages going beyond or coming from beyond Western Union lines. We desire to call special attention to this in the hope of effecting some change for the better. Please therefore give attention to the following: When a message originates at, say, Ypsilanti, Michigan, and is sent by way of Detroit for London, Ontario, paid, the tariff being say one dollar, 50 cents for each line, Ypsilanti will credit and Detroit check, 50 and 50, or one dollar. But if the same message is sent collect, the check against Detroit will be 50 cents only, which is all Detroit collects from the Canada line. So, where a message is received by Ypsilanti from London, Ont., paid, the check is only 50 cents against Detroit, that being all the amount received by Detroit from the Canada line. And yet offices are everywhere checking connecting offices such as Detroit full rates for the whole distance, whether paid or collect, charging what they ought to know such offices do not and cannot receive.

We ask attention to this numerous class of errors, and trust that managers will exercise greater care in the entry of messages of this character.

On Monday, during a terrific hurricane off the south-west coast of Ireland, the 1866 Atlantic cable ceased working. The fault is not yet precisely localized, but it is reported to be about 25 miles from Valentia, and consequently in shallow water. As there are still two cables in good working order messages will not be delayed to any appreciable extent.

The Spanish authorities are appreciative of the terrors of lightning in Cuba. When an operator is drafted into the army he ranks and receives pay as an officer. It must be that Spaniards are acquainted with Greek mythology, and that familiarity with the legend of Ajax has had the effect of inducing a wholesome respect for his descendants and successors.

Mr. ORTON arrived out on the 6th instant in greatly improved health.

THE SECRECY OF THE TELEGRAPH.

To many of the employes it is a question of serious consideration how far their individuality is merged into the machinery of the telegraph. Whether or not it is their duty, in becoming cognizant through the confidential relation in which they are placed, of such apparent facts, the divulging of which would aid in detecting crime, or the arrest of criminals or fugitives from justice, to give this information in the interest of justice and public morality. With others another difficulty is present. The question suggests itself how far can they be justified in refusing to make known the contents of a message, either from or addressed to a party suspected or known to be an offender against the law, when this information is asked or demanded by the police authorities. Cases similar to these have arisen, and have been referred to the JOURNAL, with a request that the questions be stated plainly, and the duty of all connected with the service be clearly defined. The whole matter is resolved into this: how far can the telegraph, in holding the contents of messages sacred, be considered as aiding and abetting crime?

In order that we may be clearly understood, it is first necessary to point out the relation each employé bears to the whole. He is simply one of the components. In the broad view he has no independent individuality; he is part of the machine. He has no more right to act from an assumed idea of morality or justice than a belt could have in conveying power to a machine supposed to be used in the prosecution of an unlawful business. The telegraph is responsible for nothing. In its subservient character it cannot know and should not assume that any of its patrons are rogues. It simply performs a service for pay; transmitting so many words for so much money.

The principal essentials of the telegraph are two—speed and secrecy. It is with the last-named that we have now to do.

It must be held that the contents of a message is sacred, not to be divulged upon any consideration except by regular order of a court having competent jurisdiction, and then only in the manner directed in Executive Order No. 147, which reads as follows:

No original sent message, or duplicate of a received message, will be allowed to pass out of the possession of the Company, except by authority of an Executive Officer.

Whenever a manager or other employé is subpoenaed on the part of the sender or receiver of a message, to produce it before a court or other legal tribunal, he will comply with the subpoena, and afterward return the message to the files. When subpoenaed by any party other than the sender or receiver, he will take the message into court and submit to the Judge that he ought not to produce it, the communication being privileged, and that he cannot do so unless a rule of court is entered requiring it. If such rule is entered the manager must obey it, asking the clerk to give him a copy of the rule and message.

The subpoena and other papers in connection therewith should be retained on file with the message to which they relate.

Inexperienced managers are sometimes likely to be overawed by the official position of a person making this demand, and thus be led into a betrayal of trust. Let it be understood that to no person what-

ever should the contents of a message be made known, except as provided for by the regulations of the Company. This is one of the first duties of a telegraph employé, rigid observance of which maintains and justifies the confidence of the public in the administration of the telegraph.

DEATH OF FREDERICK COOMBS.

The following notice appeared in the *New York Herald* of Saturday last:

Coroner Woltman yesterday held an inquest at No. 133 Franklin street, on the body of Frederick Coombs, the venerable looking man so often seen in the streets of New York for many years past, attired in the garb of a Revolutionary soldier, knee breeches, three-cornered hat, large steel shoe buckles, and wearing long white hair hanging down over his shoulders. Mr. Coombs died of heart disease. He was seventy-one years of age, and born in England.

Something more than the foregoing seems due to the memory of Mr. Coombs, who in the prime of his manhood was a person of undoubted ability, and at all times of unbounded generosity. His mind was of an inventive turn, and during the period of the foreshadowing and birth of the electric telegraph, when many active intellects were concentrated upon the yet unsolved problem, his attention was drawn to the fascinating study, and it is an indisputable fact that he brought forward a system of electric telegraph and publicly exhibited it at Washington some time in 1840. It was exhibited at the fair of the American Institute in this city, in that year, and was awarded a premium, but, like many others which had been brought forth, it was impracticable, yet, in view of what was accomplished, the name of Frederick Coombs deserves honorable mention in the history of the telegraph.

For many years past his intellect has been somewhat deranged, but in his simple earnestness of manner he always commanded respect. He seemed to have an indefinite idea that his right and claim to the invention of the electric telegraph was unjustly withheld, and that Congress could and would acknowledge this, and reward him, if the matter was properly placed before them. In this view he was a constant caller at the executive offices of the telegraph companies and at many of the offices of the leading newspapers, soliciting signatures to petitions to Congress, which were never refused, greatly to the delight of the old man. His features bore a striking resemblance to those of Benjamin Franklin, as shown by portraits of the latter. It is probable that this fact, which he well knew, and was pardonably proud of, was the reason that he invariably appeared dressed in the costume in vogue in the time of that philosopher.

He claimed, and the documents which he always had with him seemed to show, that he had been hardly dealt with by many whom he had assisted. Of this we cannot judge. He is now before the tribunal where all things are made straight. Peace be to his ashes. The world is certainly better because a man of the pure nature of Frederick Coombs has dwelt therein.

NEW CODE OF RULES.

The number of suggestions received during the past two weeks is, of course, small. It was not to be expected that the stream would flow as strongly after the first flood. Many duplicates of the same thought have come which have not been published, and the reason for which the writers will, of course, understand. We have aimed to give every new idea or desire a place, but not to repeat those already made.

It will be observed that the suggestions we have published, although they have been, almost without exception, practical and good, have not been, as a general thing, laboriously and thoughtfully formulated into shape, with the nicety and precision with which a rule to be useful must be constructed. No doubt it has been thought that such an attempt would be doing our work, and an impertinence. But it is not so. There is no service which can be more acceptable than just such a one as shall clearly and sharply and vigorously so compose a rule on some vital point as shall crystallize in good plain English the action under it. Of course we are endeavoring to do this with the aid of the interesting correspondence which masses itself before us; yet we feel that we need the aid of able men throughout the lines, and believe that many valuable papers are yet to be received which will be of essential service in shaping the result. The time seems to have come when a Code of Rules should be constructed which will be a perfect manual for every department of the great Company whose operations cover so vast a territory, and where every man in its employ may find an answer to every inquiry as to any duty connected with so vast a service. No man should withhold a thought which is likely to contribute to such a result.

One or two points seem very clear:

- 1.—The necessity of the check being sent in advance of the message.
- 2.—The insertion of such qualifying words in connection with any message as may be necessary to designate any special service, and have these so embodied that they cannot be omitted or mistaken. Thus, in the matter of collect messages, so fruitful a source of labor, error and loss, we shall urge, in addition to the ordinary check preceding the message, the words "collect fifty" (where the charge is 50 cents) after the signature, to be counted and charged for, as necessary to a correct service.
- 3.—The dropping of the word "paid" in checks as unnecessary, all messages being presumed to be prepaid unless specially qualified as collect or free. This will help still more to avoid error by changed checks.
- 4.—The insertion into the new Code of the forms of all classes of messages, showing the arrangement of the parts, the endorsements, the checks, the special directions, the charged and uncharged words, so as to secure perfect uniformity, and make ignorance of the construction of a message practically impossible.

Various other points seem quickly assuming a practical and useful shape, but to which we cannot now refer.

From St. Albans, Vt.

- 1.—Provide rules and regulations defining the messenger's duties, and require each one to carry a copy for exhibition to thoughtless persons who "will call," or refuse to pay charges, or send them to a third person interested, or on other errands, causing delay to waiting messages at the office, or other injury to the company's interests by squandering its time.

- 2.—Establish a different system for taking receipts—one by which each message can be receipted for by itself, without exhibiting the names of persons who have received previous messages.

- 3.—The receipt to be in form that can be conveniently filed away with the preserved copy of the message delivered. Thus keeping the complete original record of the message, where it is always handy for reference, without, as now, being dependent upon the messenger's book, often inaccessible when wanted.

- 4.—Would suggest an envelope with a flap attached to its back. This flap to present a duplicate of the face of the envelope with a receipt in blank—to be torn off and returned to the office.

- 5.—Print on face of envelope or back of receipt—"An answer to this message will cost — for 10 words, and — for each additional word."

- 6.—Provide messengers with a small tariff sheet for rates to principal points.

From Lansingburgh, N. Y.

- 7.—All messages must be prepaid, except answers, where the rate for ten words is under forty cents.

- 8.—Rules affecting the reception of messages to be posted in all offices on W. U. lines.

- 9.—Abolish Free Message Report.

- 10.—All "D. H.," or free messages, must be sent *paid*, or *collect* (except R. R. messages, of which no account is made, and service messages,) and checked same as commercial business, credit for the same being taken in the account current, and copies of messages sent *paid*, and received *collect*, with reason for being deducted as free, endorsed on the back of each message, must be returned with reports to Superintendent as vouchers.

From Tiffin, O.

- 11.—That a space be left in blank No. 7 for the insertion of the County.

- 12.—That the check error department insert the County on blank 18.

From Boston.

- 13.—Rule to limit number of free words.

From Opelika, Ala.

- 14.—Special delivery messages to be prepaid.

Example of their construction.

JOHN SMITH, Decatur, Ga.

By special messenger,
Atlanta, Ga.

Mrs. SMITH very sick, come immediately,
JOHN BROWN.

Report delivery charges, which are guaranteed.
15 words. BEN. JOHNSON, Manager.

From Buffalo, N. Y.

- 15.—Rule 13. Six last lines changed to read: "In such cases 'Manager's answer' will be written and sent after the check, and will be counted and charged for. The Manager of the office to which the message is transmitted, will, immediately upon its delivery being known, telegraph the sender of the message, giving time of delivery, and check the message at half rates."

This rule should be printed on large cards and posted conspicuously in offices.

- 16.—Receipt for delivery is not always possible. Drivers will not give them; men on 'change often refuse. Rule should admit application to these cases.

From Elgin, Ill.

- 17.—Messages don't need word "Paid." If word "Paid" was dropped and word "Collect" charged for, checks would be right every time.

From Cleveland, O.

- 18.—The necessity of every operating table showing the number of the wire connected therewith, the name of every office on the circuit, with its location and distance and character, the name of the offices used for testing, so that a new operator may be at once fully informed.

- 19.—Managers or operators leaving the circuit open unnecessarily, subject to a fine of three dollars for each offense.

- 20.—Struggling for circuit, subject to a fine of two dollars for each offense.

- 21.—Using ground wire unnecessarily, subject to a fine of one dollar for each offense.

From Nashville, Tenn.

- 22.—Would suggest that you call a Convention to consist of, say ten District Superintendents, ten Managers and ten Chief Operators, selected of the best and most practical men in the service; let them meet in New York, where they will have the advantage of consulting with the President and other executive officers, and let them make the rules for their different departments; then we will get something practical, and that will prove beneficial to all concerned. Of course all the General Superintendents should be present at such a meeting. See if it cannot be done. I know the rules for the operating department can be greatly improved.

From Brunswick, Me.

- 23.—Rule giving instruction how to determine air lines in fixing local rates.

AN EMBARRASSED TELEGRAPHER.

The late King of Saxony was in the habit of attending all the State institutions to see that they were kept in working order. One day King John appeared at the telegraph office of a small station, taking the clerk by surprise.

The official had only just time to telegraph to his colleagues at the next station, "The King has just arrived on a tour of inspection," before he was summoned to give all possible details to his sovereign with regard to the amount of traffic in the place, the number of dispatches received, the number sent out, etc. Presently a message came along the wire, which the clerk read with great embarrassment. "What are the contents of that dispatch?" inquired the king.

The official stammered out the contents were unimportant, but as the King insisted on being informed of them, the unhappy clerk was at length compelled to acknowledge that he had telegraphed to his neighbor, "the King has just arrived," and that the answer he had received ran thus: "The King pokes his nose into everything."

AN ELECTRICAL DESERT.

In the course of his travels in Africa, the late Dr. Livingstone came across an electrical desert, of which, he said, the hot air is at times so strongly charged with electricity that a bunch of ostrich feathers held a few seconds against it become as strongly charged as if attached to a powerful electrical machine, and clasps the advancing hand with a sharp crackling sound.

Mr. SARGENT of California introduced, by request, in the Senate, on Wednesday, 8th inst., a bill to secure what is termed anti-monopoly ocean cable communication between Europe, America and Asia. It gives to W. Cornell Jewett and his associates all the rights, powers and privileges to land, use and operate ocean cables in the interests of the American Government and people between Europe and New York, or any other desirable points on the Atlantic coast; also between San Francisco or any other desirable points on the Pacific coast and China and Japan, or desirable points of Asia, under the same provisions, restrictions and limitations as granted by the Telegraph Act of March 29, 1867. It was referred to the Committee on Foreign Relations.

In an address recently delivered to an association of telegraphers in England, the speaker claimed the art of telegraphy as "the right hand of peace and the necessity of war. It is already harnessed to every storm, it outlines each railroad, it feeds and animates the press, and touches all things."

THE SERVICE.

WESTERN UNION TELEGRAPH COMPANY.

FEBRUARY, 1874.

APPOINTMENTS.

Wm. Moore, 145 Broadway.
J. F. Crate, Board Broker.
W. H. Egan, Fifth Ave. Hotel.
T. J. Geary, Corn Exchange.
T. F. Keller, 134 Pearl st.
Miss M. E. Read, Everett House.
Jas. Wafer, Cotton Exchange.
A. W. Carr, Winfield, L. I.
Miss N. B. Fuller, Boston, Mass.
J. F. Griffiths, "
O. L. Barron, "
C. Connolly, "
M. M. McLean, "
Mrs. H. M. Chapman, "
S. T. Leeke, "
H. M. Pepper, Springfield, Mass.
A. L. Hodges, Roxbury.
Ira S. Hall, Shaker Village.
W. B. Ingraham, Sandwich.
Miss A. F. West, Cambridgeport, Mass.
C. C. Burghardt, Lisle, N. Y.
J. W. Krause, Suspense Bridge, N. Y.
W. H. Wires, Charlestown, W. Va.
C. N. Wells, Doe Gully, W. Va.
G. K. Smith, Grafton, "
E. M. Hilderman, Orwings Mills, W. Va.
F. E. Fassett, Bloomington, Ill.
F. J. Benson, Dubuque, Ia.
P. J. Murphy, Keokuk, "
C. S. Soule, Sioux City, "
J. S. Thompson, Peoria, Ill.
J. J. Soule, "
G. F. Walker, Quincy, "
Mrs. J. Londerback, Chicago.
H. Fenton, Col. Spgs., Col.
C. L. Danforth, Springfield, Mo.
J. C. Hanchett, St. Louis.
J. W. Cooke, "
J. Swindle, "
A. Prescott, "
W. E. Maury, "
H. H. Jones, Camp Douglas, Utah.
J. Horan, Ft. Laramie, Wyo.
W. J. Biggar, Hooper, Neb.
J. Moirson, Salt Lake, Utah.
J. B. Campbell, Va. City, Nev.
J. F. Baxter, Kennedy Sta.
G. S. Duncan, Oil City, Pa.
S. H. McKee, Parker's Landing, Pa.
J. L. McBratney, Petrolia, Pa.
Geo. Farwell, Titusville, "
G. A. Howard, Alpena, Mich.
Miss E. A. Houghton, Bay City, Mich.
J. F. Cooper, Bay City, Mich.
E. H. Thresher, Buffalo, N. Y.

RESIGNATIONS.

G. M. Simmons (Dead), 145 Broadway.
Miss E. K. Seales, 145 Broadway.
H. J. Brower, Fulton Market.
J. C. Collister, Pier 28, N. R.
B. D. Kirkland, Cotton Ex.
J. H. Pippitt, Winfield, L. I.
W. B. Wilde, Boston.
S. J. Armsstrong, "
D. Power, "
Mrs. Atwell, "
E. A. Root, Hartford, Ct.
F. E. Curtis (Dead), Springfield.
C. W. Hodges, Roxbury, Mass.
Miss L. Mundy, Suaker Village, Mass.
C. B. Hall, Sandwich, Mass.
Miss T. Smith, Cambridgeport, Mass.
A. W. Hawks, Charlestown, W. Va.
J. F. Hopkins, Doe Gully.
J. J. Malone, Grafton, W. Va.
C. Painter, Orwings Mills.
J. H. Covert, Suspension Bridge, N. Y.
J. Bierhart, Syracuse, N. Y.
W. A. Ausin, Utica, "
J. A. Osborne, Albany, "
E. Holland, Ghent.
C. Wheeler, Mechanicville, N. Y.
B. G. Rice, Poughkeepsie, N. Y.
A. W. Campbell, Salem, N. Y.
A. Prescott, Troy.
R. S. Emmerson, Rondout.
J. H. Cummings, Bellows Falls, N. Y.
J. H. Humphreys, Burlington, Vt.
F. M. Dalley, Leicester, Vt.
Miss K. T. McElroy, Middlesex, Vt.
E. Powers, Rouse's Point, Vt.
Geo. E. Merrill, W. Ossipee, N. H.
H. Foudersmith, Phila., Pa.
W. H. Boggs, Harrisburg, "
W. H. Crotzer, Lewisburg, "

F. L. Bierhardt, Syracuse, N. Y.
T. H. Allen, Utica, N. Y.
W. H. Lumpkins, Hornellsville, N. Y.
E. T. Byerson, Ridgewood, N. J.
F. G. Bartlett, Ghent, N. Y.
Jonas Clark, Poughkeepsie, Vt.
T. E. McAllister, Rondout, N. Y.
J. W. Elkins, Salem.
T. Quakenbush, Waterford, "
F. M. Davis, Bellows Falls, Vt.
A. Blanchard, Leicester, Vt.
F. M. McElroy, Middlesex, Vt.
I. Powers, Jr., Rouse's Point, N. Y.
T. F. Howe, Jr., St. Albans, Vt.
I. M. Smith, W. Ossipee, N. H.
S. W. C. Clogley, Baltimore, Md.
J. Catherman, Lewisburg, Pa.
J. F. Downing, New Brunswick, N. J.
W. D. Blake, Philadelphia.
W. H. Kidney, Cleveland, O.
J. C. Adams, Detroit, Mich.
J. O'Brien, Sandusky, O.
J. K. Rose, Vincennes, Ind.
S. O. Fitzgerald, Barksdale, Va.
E. Duke, Charlotte, N. C.
J. W. Gibson, Portsmouth, Va.
S. H. Hotz, Stony Creek.
W. F. Franklin, Rome, Ga.
I. S. Snodgrass, Brewton, Ala.
T. F. Evin, Salem.
I. W. Regan, Cave Spgs., "
T. Sims, Deer Park, "
A. H. Grant, Allenville, Mo.
H. Riley, Benton, Ark.
J. H. Moran, Charleston, Mo.
H. H. Paydon, Peach Orchard, Ark.
J. L. Morris, Shreveport, La.
J. M. Powers, Burnsville, Miss.
W. L. Williams, Danville, Tenn.
D. G. Breed, Guthrie, Ky.
A. W. Mitchell, Kimball, Tenn.
J. Teague, Stanton, "
J. Hopwood, Walton, Ky.
W. B. Summer, Worthville, "
E. J. Shepherd, Dallas, Tex.
G. H. Gordon, Elgin, "
E. B. Powers, Galveston, "
H. W. Scheldmante, Grapeland, Tex.
F. D. Ungles, Mineola, Tex.
U. J. Allen, Palestine, "
J. G. Meyerhoefer, Rice, "
T. C. Cooper, Riverside, "
R. H. Thomson, Durant, Miss.
P. Vidal, Magnolia, "
J. B. Allen, McClity, "

J. L. Buckman, Pottsville, Pa.
O. M. Lunzeon, Williamsport, Pa.
W. A. Connor, Washington, D. C.
J. A. Jordan, Bloomington, Ill.
E. M. Street, Council Bluffs, Iowa.
G. Garfield, Sioux City, Iowa.
W. P. Dinsley, Peoria, Ill.
W. A. Anderson, Grapeland, Tex.
T. G. Vosberg, Houston, Tex.
A. C. Atherton, Palestine, "
O. W. Poxon, Rice, "
J. F. West, Durant, Miss.
C. W. Smallwood, Magnolia, Miss.
F. M. Flint, McComb City, Miss.

TRANSFERS.

Name.	From	To
G. W. B'anchard	Station H.	1,000 6th Avenue.
E. M. Bullon	Everett House.	St. Cloud.
P. J. Caeey	Board of Brokers.	Ruffed.
W. J. Conklin	184 Pearl street	Cotton Exchange.
J. J. Egan	5th Avenue Hotel.	1,000 6th Avenue.
N. N. Stevens	Corn Exchange.	Fulton Market.
J. H. Hayes	Sandusky, Ohio.	Toledo, O.
J. B. Bos	Waterford, N. Y.	Mechanicville, N. Y.
R. B. Warriner	Barksdale, Va.	Meherrin, Va.
W. H. Adkins	Rome, Ga.	Talladega, Ala.
J. E. Goode	Talladega, Ala.	Tuscaloosa, Ala.
C. D. Thompson	Cave Springs, Ga.	Oxford, Ala.
J. R. Cowden	Deer Park, Ala.	Enterprise Ala.
Miss E. Dudley	Fort Mills, Ga.	Covington, Ga.
Miss Monck	Savannah, Ga.	Lake City, Fla.
W. F. Hunsacker	Dayton, O.	Cincinnati, O.
L. B. Bobo	Cypress, Tex.	Hearne, Tex.
T. R. Lewis	New Orleans, La.	Galveston, Tex.

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NEDELAND, April 17.	SWITZERLAND, May 9.
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For Philadelphia.	For New York.
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VAERLAND, May 27.	NEDELAND, May 12.

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H. J. FOREMAN, "
W. J. FOY, "
ED. A. KEENE, Jr., "

Your little Sounder has created quite an excitement among the boys here.

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MARC. GAUTIER, W. U. T. Office.

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DEAR SIR: Please find enclosed 60 cents for two more of your "Snapper" Sounders.

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EDD. LAGETT,
Manager W. U. Office.

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H. HALL.

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JOURNAL OF THE TELEGRAPH.

VOL. VII. NO. 9.

NEW YORK, MAY 1, 1874.

WHOLE NO. 156.

THE TANGENT GALVANOMETER AND ELECTRICAL MEASUREMENTS.

By A. S. BROWN.

No instrument for electrical measurements is so well adapted to the ordinary requirements of the telegraph office as the tangent galvanometer. It is inexpensive, and so simple in its construction and operation as to be easily understood and used by any intelligent operator. As it is about to be extensively introduced into the larger offices throughout the country by the Western Union Company, some description of its construction, the principles of its operation, and the manner of using it, may be of interest to the readers of the JOURNAL.

This instrument, in the form adopted by the Western Union Company, consists of a magnetized needle a little less than an inch in length, suspended upon a point above a disc five inches in diameter, and surrounded by four coils of wire, with resistances of 60, 20, 9 and 1 ohm each, and also by a band of copper, the resistance of which is so small as to be inappreciable. It is provided with five terminals, marked respectively 0, 1, 10, 30 and 90, to which the coils are so connected that, by inserting a plug at 0, the copper band only is in the circuit; when the plug is at 1, the band and the one ohm coil of wire are in circuit; with the plug at 10, the band, and the one and nine ohm coils are in circuit (making in all a resistance of ten ohms); with the plug at 30, all, except the sixty ohm coil, are in circuit; and with the plug at 90 all are in circuit, making the resistance of the galvanometer ninety ohms. Fixed to the needle, and at right angles with it, is an aluminum pointer extending entirely across the disc. The circumference of the disc is divided on one side into degrees, and on the other into divisions proportioned to the tangents of degrees. The strength of any current passing through the coils of this instrument being directly proportional to the *tangent* of the angle of deflection, it is at once shown by the reading on the tangent side of the disc. The instrument stands upon three leveling screws, by which it is adjusted to a level position.

Accompanying the galvanometer, and used in con-

nection with it, is a rheostat, or box of resistance coils, so arranged that any desired resistance from 1 to 10,000 ohms may be thrown into the circuit.

Before proceeding to an explanation of the manner of using the instrument, it is necessary to refer briefly to certain electrical laws upon which its operation depends. These laws are at the foundation of electrical science, and the importance to every telegrapher of a clear understanding of them can hardly be over stated.

The strength of current from a battery through

point of lowest potential (the negative or zinc pole) through any conductor connecting the two. The electro-motive force of any battery is directly in proportion to the number of its cells, and is entirely independent of their size. A cell as small as a thimble gives the same electro-motive force as one as large as a barrel, provided the materials of which they are composed are alike. Two cups, however, of any size give twice as much as one, fifty cups fifty times as much, and so on; and the greater the electro-motive force, that is, the greater the difference of potential

maintained between the two poles of the battery, the greater will be the quantity of current passing through the conductor connecting them, just as in the case of the two bodies of water, the quantity flowing through the connecting pipe in a given time is greater or less in proportion to the difference in elevation of the two.

But it is evident that in the case of the water, the quantity passing through the pipe will be determined, not alone by the amount of pressure due to difference in elevation, but also by the size or conducting capacity of the pipe. Leaving out of account the effects of friction, this quantity, with a given pressure, will be just in proportion to the size of the pipe. In like manner, with a given electro-motive force, the quantity of electricity passing in the circuit is exactly in proportion to its conducting capacity.

The resistance of a wire is the opposite or converse of its conductivity, and in comparing the conducting power of two bodies it is usual to deal in terms of resistance. The greater the conductivity the less the resistance, and *vice versa*. Bearing this in mind, it follows from what has been stated that with a given elec-

any circuit is dependent upon two conditions, and only two; i. e.: 1st. The electro-motive force of the battery; and 2d, the resistance of the circuit. The electro-motive force of a battery is the force or power which it has of maintaining a difference of electric potential at its opposite poles. Electricity may be said, like water, to seek its level. If two bodies of water at different altitudes are connected by a pipe, the water will flow from the higher to the lower until an equilibrium is established. In like manner electricity will flow from the point of highest potential (the positive or copper pole of the battery) to the

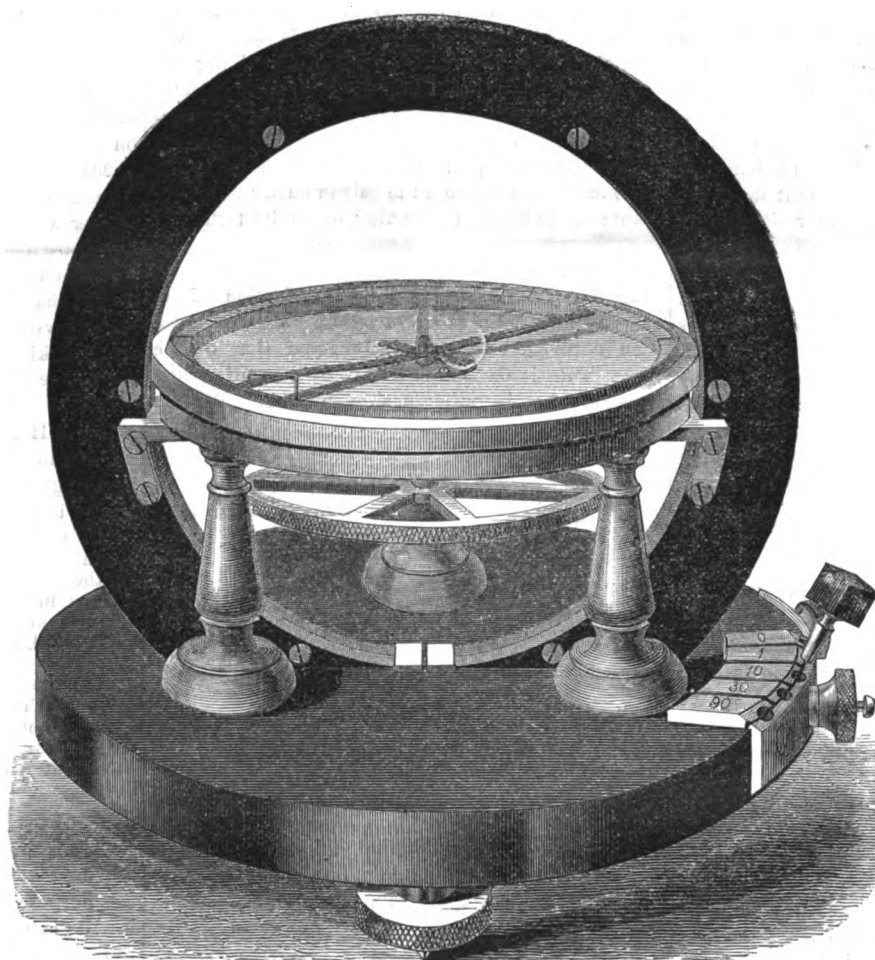
tro-motive force, the quantity of current, being *directly* proportioned to the conductivity, is *inversely* proportional to the resistance of the circuit.

By the term "resistance of the circuit," is meant the entire resistance, including not only that of the wire, instruments, &c., but also that of the battery.

This brings us to an understanding of what is known as Ohm's law, which is nothing more than a statement of the above mentioned principles. It is usually expressed in algebraic form thus:

$$Q = \frac{E}{R}, \text{ where}$$

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Q—The quantity of electricity passing in the circuit in a given time ;

E—The electro-motive of the battery ; and

R—The total resistance of the circuit.

A knowledge of algebra is not required to enable any one to see that in this equation the value of *Q* depends upon the relative values of *E* and *R*, and that *Q* becomes greater as *E* is increased or *R* decreased, and less as *E* is decreased or *R* increased. This will be more apparent if figures are substituted for the letters *E* and *R*, thus: say that the electro-motive force of the battery is 4 volts,* and the resistance of the circuit 8 ohms, the quantity of current will then be $\frac{1}{2}$ farad. If the electro-motive force is increased or decreased without changing the resistance of the circuit, the current strength is increased or decreased in the same proportion ; and if the resistance is increased or decreased, the electro-motive force remaining constant, the current strength is also changed, but now it is in *inverse* proportion, that is, it is greater when the resistance is decreased and less when it is increased. Thus if we double the resistance in the case above assumed, making it 16, the quantity of current will be $\frac{1}{4}$ farad, only half as much as before. This principle furnishes a very simple and good method of measuring the internal resistance of a battery. For example, if we wish to ascertain the resistance of a battery consisting of one Daniell's cell, we connect its two poles to the two terminals of the tangent galvanometer in such a way that the current shall pass through the copper band only, the resistance of which, as before stated, is so small as to be neglected. When so connected we get a deflection of ten divisions on the tangent scale. This deflection indicates that a certain quantity of electricity is passing. There being now no resistance in this circuit, except that in the battery, it is clear that if, by means of the box of resistance coils, we add resistance until the deflection of the galvanometer is reduced one-half, that is, from 10 to 5, showing that only half as much current as before is passing, we shall then have doubled the total resistance of the circuit, and that consequently the resistance so added is equal to that of the battery.

A battery of fifty or a hundred cups may be measured in this way equally as well as one cell. If, however, the resistance per cell is considerable, the deflection of the needle when the "0" coil is used will be too slight to be easily read. In such case the 1 ohm coil may be used ; but when this, or any coil of higher resistance is used, the galvanometer resistance must be taken into account. This is the more important where the battery to be measured consists of only a few cells. As before shown, in order to reduce the deflection of the needle one half, it is necessary to double the *total* resistance. This total resistance comprises the resistance of the battery, and also that of the galvanometer ; and when this is doubled the amount added must be equal to that of the battery plus that of the galvanometer. It is therefore necessary to deduct the galvanometer resistance from the amount added, in order to get the resistance of the battery. For example, suppose that with the battery connected through the 1 ohm coil of the galvanometer the deflection is 50, and to reduce this to 25 it is necessary

* The volt is the unit of electro-motive force as the ohm is that of resistance. The farad is the unit quantity of electricity, and is that quantity which, with an electro-motive force of one volt, flows through a circuit of one ohm resistance in one second of time. The electro-motive force of a Daniell's or Callaud battery is about one volt per cell, and of a Grove about 1.8

to add 8 ohms. This 8 ohms is equal to the galvanometer resistance added to that of the battery, and the latter is found by deducting from the 8 ohms the resistance of the galvanometer, leaving 7 as the resistance of the battery. In brief, the following is the Rule for measuring the internal resistance of a battery.

Connect the battery in circuit with the galvanometer alone, and note the deflection on the tangent scale. Then insert resistance in the circuit until the deflection is reduced one-half. Deduct from the resistance so inserted that of the galvanometer, and the remainder will be equal to the resistance of the battery.

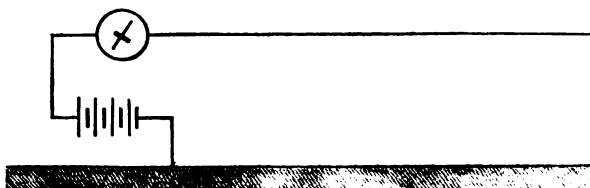


Figure 2.

In measuring the resistance of a line by the tangent galvanometer the same general principles are involved. The mode of procedure is as follows : One pole of a battery being grounded (fig. 2), connect the other through the galvanometer to the line, the distant end of which is also connected with the ground (all relays being taken out of the circuit) and note the deflection. Next disconnect the line from the galvanometer and substitute the rheostat, connecting one of its terminals to the galvanometer and the other to the ground (fig. 3). When this is done insert resistance by removing plugs from the rheostat until the deflection of the galvanometer is the same as before ; the resistance then unplugged will evidently equal that of the line. This is the simplest way of measuring line resistance, but is rather a slow process. When a

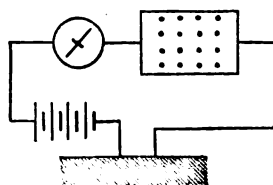


Figure 3.

number of lines are to be tested, it is usual to proceed as follows : Connect the battery, galvanometer and rheostat as shown in figure 3, and remove plugs from the latter until a convenient deflection is obtained. Multiply the resistance in circuit by the deflection of the needle on the tangent scale. The sum so obtained is called the *constant* of the galvanometer. Next substitute the line wire in place of the rheostat (fig. 2), and again note the deflection. Divide the number first obtained (the constant) by this deflection and the quotient will be the resistance of the circuit. From this deduct the resistance of the battery and galvanometer, and the remainder will be that of the line.

For example, suppose the resistances of three wires are to be measured with the battery (90 ohms), galvanometer (10 ohms), and rheostat (5,000 ohms), the deflection is 20. The constant of the instrument is therefore

$$5,100 \times 20 = 102,000.$$

Substituting each of the line wires for the rheostat, the deflections obtained are:

No. 1	65
" 2	55
" 3	40

The resistances of the circuits are:

$$\begin{aligned} \text{No. 1} &= 102,000 + 65 = 1569 \\ " 2 &= 102,000 + 55 = 1854 \\ " 3 &= 102,000 + 40 = 2550 \end{aligned}$$

And the resistance of each of the wires is found by deducting from the above that of the galvanometer and battery (100 ohms), thus :

$$\begin{aligned} \text{No. 1} &= 1569 - 100 = 1469 \\ " 2 &= 1854 - 100 = 1754 \\ " 3 &= 2550 - 100 = 2450 \end{aligned}$$

The resistance per mile of wire is obtained by dividing the total line resistance by the number of miles of wire tested. Thus in the above example, if the length of No. 1 is 75 miles, and of Nos. 2 and 3 100 each, the mileage* resistance is :

$$\begin{aligned} \text{No. 1} &= 1469 \div 75 = 19.5 \\ " 2 &= 1754 \div 100 = 17.5 \\ " 3 &= 2450 \div 100 = 24.5 \end{aligned}$$

Tests for line resistance should be made in clear weather and with the line free from "escape."

The resistance of insulation of a line is measured in the same manner, the line of course being "open" instead of "grounded" at the distant end. The *mileage* insulation of a line is found by multiplying the total insulation resistance by the number of miles of wire tested. The standard or minimum of insulation allowed in the most unfavorable weather on English lines is given by *Culley* (Edition of 1874) as 200,000 per mile. Tests of line and insulation resistance should be made with that coil of the galvanometer which gives a deflection of the needle somewhere between 10 and 60 degrees. Before using the instrument, it must be leveled and adjusted in position so that the pointer shall stand at zero. A light tapping with the finger upon the glass above the dial while making tests helps to overcome the friction of the needle upon its support.

THE TELEGRAPH IN MEXICO.

The annual message of President Lerdo, read to the Congress of Mexico on April 1, contains the following in relation to the Mexican telegraph :

" With a view of extending, day by day, the telegraph lines, the material on hand is being improved, another considerable quantity having been ordered. Special interest has been and will be taken in the construction of the long lines from Michoacan to Jalisco, San Luis to Durango, Durango to Chihuahua, Mazatlan to Guaymas, Tampico to Metamoras and Tabasco to Chiapa. We ought to expect that very soon the City of Mexico will be in communication by telegraph with all the capitals of the States and the principal ports of the Republic, the wire being carried afterwards to Lower California, for, from the investigations made, such a line seems very convenient.

THE FROG BAROMETER.—In some countries frogs are used as barometers—the species employed for this purpose is the green tree frog. They are placed in tall glass bottles with little wooden ladders, to the top of which they always climb in fine weather, and descend at the approach of bad weather. This is a cheap and highly interesting weather glass where the green tree frog is to be procured in its natural state.—*Science Gossip*.

A CORRESPONDENT, writing from Cape Coast Castle on the 20th February, says: " I suppose you heard that the Ashantees could not understand our telegraph, and so they, in imitation, carried a line of white cotton from tree to tree all along the road, passing it here and there through rags of white calico."

* The mileage resistance of iron wire of good quality is about as follows: No. 8, 14; No. 9, 16; No. 10, 21 ohms.

ELECTRO-PLATING.

At a session of the Physical Association held in Frankfort, on August 30 last, Dr. Otto Volger delivered an address on the history and progress of the art of depositing metals by galvanic action, of which the following is an abstract:

At an early date it was known that a current of galvanic electricity was able to decompose liquids, and that metals deposited from solutions of their salts by this means assumed fantastic shapes, which appeared so similar, at the first glance, to vegetable growth, that they were called galvanic trees, or metallic vegetation, although really consisting of crystals, and formed according to the laws of crystallization. Professor Böttger took especial delight in producing this sort of vegetation with different metals.

The use of such metallic deposits for electro-plating was discovered accidentally. In 1830, Mr. J. P. Wagner, of Frankfort, and Professor Jacobi, of St. Petersburg, were endeavoring to employ electromagnetism as a motive power, instead of steam. Jacobi employed a Daniell's battery, which is distinguished for its constant and regular action. It consists of an outer cup of copper, and an inner cell of unglazed porcelain which contains the zinc rod. The intermediate space is filled with a saturated solution of sulphate of copper. When the battery is working, this solution of blue vitrol is slowly decomposed, depositing metallic copper, which finally becomes injurious, and must be removed. Once when Jacobi was busied with removing such a deposit from his copper cup, he noticed that there were several layers of copper, each having the form of the sides of the copper vessel, and hence, concluding that the sheet copper of which the vessel was made had split up into layers, he accused the man who made it of employing a poor quality of sheet copper. A closer investigation, however, showed him that these layers, or leaves, did not belong to the walls of the vessel, but to a new deposit of metal, which imitated, in a remarkably perfect manner, the shape of the surface of the walls. It occurred to Jacobi that this troublesome disadvantage could be turned to profit by using it for reproducing objects. In 1838, he communicated to the St. Petersburg Academy a description of his discovery of the use of galvanic electricity for reproducing objects in the arts.

Czar Nicholas requested a German chemist named Klein, who was then employed in the imperial printing office, to test the practicability of the discovery and to ascertain to what extent it was capable of development. The answer being a favorable one, he gave the discoverer the means of making his new art the common property of the whole world.

Electrotyping or plating with copper consists in merely making the object to be copied the negative element of a simple Daniell's battery. If the object is a conductor, metal for instance, and is to be only partially covered, the parts that are to remain uncovered are rendered non-conductors by coating with some non-conductor, as wax, stearin, or varnish. If it is a non-conductor, its surface is rendered conducting by brushing it over with a thin film of the finest graphite or silver powder. Murray discovered that graphite works the best. The reaction consists in the separation of the sulphate of copper into sulphuric acid and oxide of copper, while the water is simultaneously separated into oxygen and hydrogen. The sulphuric acid liberated at the anode or positive pole unites with the oxide of zinc, formed there by the oxygen given off from the decomposed water, to form sulphate of zinc, which goes into solution.

The hydrogen evolved at the opposite pole abstracts the oxygen from the oxide of copper, and

forms water, while the copper is left in a metallic state. Hence it is really the hydrogen which causes the reduction of the oxide of copper to metallic copper, at the negative pole or cathode.

Up to the year 1830, this new art was only employed for making small copies, like coins and medals, and these often came out of the mold imperfect, or were broken in detaching the mold. At that time, however, Professor Böttger prepared handsome relief plates of copper, and also employed galvanism for depositing a metallic coating on other metals, as for instance gilding silver, copper and brass. In the same year a copper plate engraver, named Kress, came to St. Petersburg, learned from Klein the galvanoplastic art, as Jacobi had named it, and became acquainted with the latter. Jacobi called his attention to the fact that he could in this way make perfect copies of his etched or engraved plates, thus multiplying the original plate so as to obtain a great number of the most excellent impressions; for it is well known that a plate soon loses its sharpness, and every impression is poorer than the preceding one. At this suggestion Kress took up the art, and by 1844 had brought it to great perfection in his business. In 1841 Professor Böttger had made a copy from one of Professor Felsing's copper plates, in Darmstadt (the *Eccs Homo*, after Guido Reni, 12½ inches by 9½ inches), which was so perfect that Felsing declared that proofs printed with it were identical with those from the original plate, and of equal value. These plates are still in existence, the one in Berlin Museum, the other at Frankfort on the Maine.

The galvanoplastic art has extended itself in three directions: 1. For covering other metals, as in electro-plating with gold, silver, copper, steel and nickel. 2. In producing objects formerly cast in metal. This has been brought to great perfection in several German cities, especially Mayence, where the smallest natural objects are copied and the largest works of art produced. Among the latter are three colossal figures on a monument in Frankfort. 3. The reproduction of engraved and stereotyped plates, and the like. In the latter, farther progress is still possible.

Early in 1840, Péligo reduced protochloride of iron by passing hydrogen gas over it, and in this way obtained metallic iron in octohedral crystals and in malleable plates. In 1846, Professor Böttger made the first attempt to decompose the chloride of iron by the electric current, and with success, but soon found that a mixture of the double sulphate of iron and ammonium and the double chloride of iron and ammonium was better for electro-plating. This he prepared by dissolving simultaneously 2 parts by weight of protosulphate of iron and 1 part sal ammoniac in water. As anodes he employed a piece of sheet iron; the cathode at once acquired a polished appearance from the metallic iron deposited on it. In this way he copied a florin in iron (several such specimens were exhibited by the lecturer). The iron is very hard, like steel, but unfortunately very brittle, so that it frequently breaks in taking it from the mold. No technical use could at first be found for it. In 1859 Jacquin found an application of it in covering copper plates with steel. This consisted in precipitating on the copper an exceedingly thin film of iron, which did not destroy the sharpness of the impression, but by its hardness offered such a protection to the copper that the latter was almost as durable as a steel plate. In this process, also, Professor Böttger's recipe proved the best, and was generally followed.

Recently, a chemist in St. Petersburg, also named Klein, has brought electro-plating with iron to a re-

markable degree of perfection. In 1868 he exhibited, before the St. Petersburg Academy, excellent results which he had obtained by using a solution of bisulphate of the protoxide of iron, and a Meidinger battery, with a piece of sheet iron as anode. Klein deposited the iron in large plates, both thick and thin, as copies from engraved copper plates, and thus combined a soft, easily wrought plate for the engraver, and an iron plate as hard as steel for the printer. The iron thus deposited was, to be sure very brittle, which Klein found to be due to the hydrogen occluded in it, its specific gravity being 7.675, or a little higher than rolled iron. By heating the iron, he succeeded in expelling the hydrogen, when it became more dense, and had a specific gravity of 7.811, which is higher than wrought iron. It was perfectly malleable, highly elastic, and could be welded like sheet steel, in short, it was an excellent malleable iron. Klein has prepared sheets of this iron weighing 16 lbs.

Electro-plating in iron will find an important and extensive use in manufacture of stereotype plates, especially for printing government paper and postage stamps, where colored inks are employed, for the iron would not be attacked by the colors containing mercury, which acts on copper and other metals.

In conclusion, the lecturer referred to the occurrence of native metals in the earth, and the theory, advanced almost 80 years ago, comparing the earth to a voltaic battery. Hardinger believed that he could prove that the surface of the earth was the anode and the interior of the earth the cathode of a galvanic battery. According to this, native metals should only be sought deep down in the earth, which is not always the case. It is much more probable that native metals have been reduced by the decomposition of organic matter. This applies especially to copper, and also to the very rare telluric iron. The graphite found in the latter is to be considered as the residuum of decomposed organic compounds. In the Rotanger sea in Sweden, native iron is found replacing particles of wood, as if petrified, and the microscope is able to detect the cells and determine that it was a species of pine wood. The interior of the cells is also filled with a deposit of iron. This is not to be attributed to the action of a galvanic current, but to the reducing power of the hydrogen liberated from the decomposition of organic matter.

CLAMOND'S THERMO-ELECTRIC PILE.

This pile would now seem to be a great reality. Three models have been prepared—(1) a tension pile equivalent to two of Bunsen's elements made of small bars; (2) a tension pile equal to four of Bunsen's elements made of small bars; (3) a quantity pile equal to four of Bunsen's elements of large bars. It may be said that the third pile can be used for the purposes of electrotyping, for of itself it will render it perfectly viable. It expends 150 litres of gas per hour, and is capable of depositing a kilogramme of copper for the price of 2 francs 50 centimes. M. Clamond has ingeniously added to all his piles a Girond regulator, which secures an almost constant heat, and an absolute constant current. On comparing this account with the invention of Messrs. Mure and Clamond (see vol. VI, page 246, of the JOURNAL OF THE TELEGRAPH) it is apparent that a great improvement has been effected in the pile as regards the cost of the production of a kilogrmm. of copper, the preservation of an almost constant heat, and, most important of all, the generating an absolutely constant current of electricity.—*Les Mondes*.

CORRESPONDENCE.

WHY IS IT?

ALBION, Mich., April 7, 1874.

To the Editor of the Journal of the Telegraph:

Why is it that Chicago always checks for business done on the last day of the month over into the next month? For instance, business done on March 31, he checks on April 1. Nine-tenths of our error sheets with him are like this.

O. B. WOOD, Manager.

BRACEVILLE, Ohio, March 30, 1874.

To the Editor of the Journal of the Telegraph:

I see in JOURNAL of March 16 suggestions in regard to rules. People through the country have got the impression that telegraphing is very expensive. If some system of advertising the rates was adopted, I think it would tend to increase the business materially. Suggestion No. 15, from New York, is a good one—to print the price of answer on message blanks. A lady, visiting me last week, said she was charged \$2.50 for a message from Wellsville, N. Y., to Braceville, O. I think she must be mistaken; but the impression she received is the same, whether correct or not. I find by reference to my ledger for October, 1873, that the message in question was checked 18 paid, 74, the present tariff being in force at that time, which is 50 and 3.

J. E. BROWN, Manager.

To the Editor of the Journal of the Telegraph:

In a late issue of the JOURNAL reference is made to your article in JOURNAL, March 15, in regard to keeping offices private. I am situated pretty much the same as Mr. Bennett therein states, my office being in same room with the Agent's and Express Office. We have special orders from Superintendent to keep offices private. I do my best, have notices posted inside and out informing parties that unless they have business no one allowed in offices. Parties coming in who I see have no business to transact I at once tell to go out; but those having business stand around after its transaction. What am I to do? Agent says he has control of office, and that I have no say, except to the one corner which is assigned me. I am also held responsible for the cleanliness of office. I do my best with that also; keep my boy sweeping (I am unable, my limbs being paralyzed), but where so many are coming in and going out it is a hard matter to keep office as neat and clean as it should be, especially when agent takes no interest in the matter. He should be held responsible with myself, and I don't think all the blame should be attached to me. I have asked agent to try and make some arrangement with Supervisor of Track to have office scoured weekly, but he seems to forget.

SELMA, Ala., April 15, 1874.

To the Editor of the Journal of the Telegraph:

How should the following message be counted:

"MERIDIAN, Miss., April 15, 1874.

MAXWELL & SON and R. & R. MAXWELL,

Tuskaloosa, Ala.:

Your shipments are in the Bigbee on ill fated train.

(Signed) _____

Meridian says 13 words. I say 16—counting 4 extra words in address. I base my view on a clause of Rule 9, in regard to two or more signatures, and counting all but the last one. My construction of this clause is that it is intended to apply with equal propriety to an address as to a signature. The message in question is addressed to two different firms

in Tuskaloosa. Please enlighten me through the JOURNAL.

CHARLES AUGUSTUS.

Answer.—It is not plain how either 12 or 16 words can be made out. But it is very clear that there are two messages of 10 words. The rule relating to signatures has no bearing upon addresses such as given above.

SAN ANTONIO, Texas, April 13, 1874.

To the Editor of the Journal of the Telegraph:

Are messages to managers of offices asking if messages sent by firms or parties were received and delivered, or requesting answers to messages sent charged at half rate, or should full tariff be collected on same both ways? An answer through the JOURNAL would be of service, and would tend to lessen check errors between offices.

N. J. PETRICH.

Answer.—Full rates should be charged for such service.

VALPARAISO, Ind., April 14, 1874.

To the Editor of the Journal of the Telegraph:

Frequently transient persons, agents for theatre troupes for instance, ask to have messages sent collect, which, on strength of Rule 11, I invariably decline doing. I am then asked why it is they can get this done at city offices and be refused at smaller places, which I am unable to explain. If such be the case, can you give an explanation?

G. A. DODGE.

Answer.—We do not believe it to be the case. All offices, large or small, are governed by the same regulation.

To the Editor of the Journal of the Telegraph:

In sending office request for answers, should we charge full rate for so doing?

ENQUIRER.

Answer.—Yes.*To the Editor of the Journal of the Telegraph:*

Why should the Company require messages to be timed and yet decline to furnish a timepiece. I have made numerous requisitions for a clock during the past six or seven years, but our supply agent heeds not. I would suggest that all offices should have some timepiece (and not guess at random), and at stated times such time indicators be regulated by wire, as on N. Y. C. R. R. It would save confusion and guessing at time.

OPERATOR.

Answer.—A timepiece should form part of the equipment of every office. It is probable that your requisitions have not been properly made. They should go through your Superintendent.

LOUISVILLE, April 28, 1874.

To the Editor of the Journal of the Telegraph:

Will you please to answer the following questions:

What would be the proper resistance of six main line sounder magnets, to be used on a line of number 9 galvanized iron wire, containing 2,760 feet continuous metallic circuit?

What would be the best size of the wire to use in the magnets?

And what would be the best number of cells, of Hill's gravity battery, to work the magnets to the best advantage?

By answering the above you will confer a great favor upon a subscriber of the JOURNAL.

W. J. STEPHENS.

Answer.—The local sounder in common use, wound with No. 24 wire, the resistance of which is a trifle more than three ohms, will work well on such a line with 15 cups of gravity battery of a size to make the resistance not more than one ohm per cell.

NOVEL APPLICATION OF ELECTRICITY.

A novel adaptation of electricity has just been applied to several of the carriages of the London Central Omnibus Company, which appears destined to add considerably to the profits of the shareholders, by providing an efficient check against the numerous petty frauds on the part of the conductors, which for some time past have seriously affected the revenue from this and other public conveyances. By a very simple piece of mechanism placed under each seat of the passengers a tell-tale or dial is made to register the number of passengers entering the carriage and the distance which each travels. There is nothing of the mechanical portion of the arrangement visible to the passenger, and the dial is so placed as to be entirely free from any chance of tampering with on the part of the conductors, while the register made is so complete and accurate that no chance of dispute can possibly arise. The electric apparatus referred to is one of the numerous inventions for which the public are indebted to Sir Charles Wheatstone, and which, together with several other of the inventions of that distinguished electrician, have been purchased by the Electric Power Company. So much importance is attached to the value of this apparatus as a check on conductors of omnibuses that already a considerable advance has taken place in the shares of the Omnibus Company, and a further extension of the system to omnibuses and tramways appears to be a boon to the shareholders of these companies.

THE FIRST REPORT OF THE BRITISH ASSOCIATION COMMITTEE ON DYNAMICAL AND ELECTRICAL UNITS.

—The first report of this Committee was made at the recent meeting of the British Association for the Advancement of Science, and is confined principally to the selection and nomenclature of units of force and energy, under which head the Committee is itself prepared to offer certain definite recommendations, which are as follows: 1st. The gramme, centimeter, and second are recommended as the units of mass, length and time, respectively; a combination which has the advantage of making the unit of mass appear identical with the mass of the unit volume of water—in other words, of making the value of the density of water appear equal to unity. From these fundamental units the units of electrical and magnetic magnitudes, now in common use, may be derived; and it is recommended that, until special names shall be prepared for them, they be distinguished from absolute units, otherwise derived, by the three initial letters, C. G. S. As regards the name to be given to the C. G. S. unit of force, it is recommended that it be a derivative of the Greek word *dunamis*—the form *dynamy* appears to be the most satisfactory to etymologists. The work done by this force working through a centimeter is the C. G. S. unit of work, for which is proposed a name derived from the Greek *erg*; the C. G. S. unit of power is the power of doing work at the rate of one *erg* per second, and the power of an engine can be specified in *ergs* per second. The common and extremely variable unit of one-horse power is about three-fourths of an *erg* per second. For the expression of high decimal multiples and sub-multiples, the system introduced by Mr. Stoney is recommended. It consists in denoting the exponent of the power of ten which serves as a multiplier, by an appended cardinal number if the exponent be positive, and by a prefixed ordinal number when the exponent is negative; thus ten to the ninth power, or one thousand million grammes, constitutes a "gramme-nine, and the one thousand millionth of a gramme constitutes a "ninth-gramme."

ESTIMATE FOR THE BRITISH POST-OFFICE
TELEGRAPHS FOR 1874-75.

The estimate of the amount required for the Post-Office Telegraph Service for the financial year 1874-75 is £938,339, exclusive of the year's interest on the purchase money for the telegraphs; and the revenue for the year is estimated at £1,270,000. The expenditure is £80,000 more than in the year 1873-74. It includes £10,000 for telegraph extension works; this sum is stated as £50,000 in one place in the estimate, but it is twice stated as £10,000, and if it were £50,000 the total would be £978,339, instead of £938,339, which is declared to be the amount required to be voted. The wires used for public messages alone (exclusive of those which belong to the railway companies, and are used principally for railway and secondarily for public purposes) form a system of 99,842 miles; and the wires leased by the department to private firms or individuals for the transmission of messages on their own special business between offices and factories, and so forth, make a system of 5,730 miles. The total, therefore, is 105,572 miles—79,485 in England and Wales, 12,284 in Scotland, and 13,803 in Ireland. There are 3,791 postal telegraph offices—2,744 in England and Wales, 447 in Scotland, and 600 in Ireland. The number of renters of private wires is 993—831 in England and Wales, 131 in Scotland, and 31 in Ireland. The department works submarine cables 420 knots in length, and having a total length of wire amounting to 1,258 knots; and there are cables 459 knots in length, and having a total length of wire amounting to 1,337 knots, which are the property of the department, but leased to and worked by the Submarine Telegraph Company. The year's estimate provides for the payment of £22,500 to railway companies as remuneration for the transaction of telegraph business at their stations on behalf of the Postmaster-General, under the 7th section of the 9th clause of the Telegraphs Act of 1868; also for a payment of £33,000 for maintenance of telegraphs by railway companies; and also £26,500 for annual rents, nominally for way leave, which the Postmaster-General has contracted to pay to certain railway companies, &c., as compensation, in full or in part, for the loss of their revisionary interests of every kind in telegraph business, way leaves, pole rents, &c. The estimate again this year was submitted to the Treasury too late to be subjected to examination by that department before presenting it to the House of Commons.

THE report of the Eastern Extension, Australasia, and China Telegraph states: The total earnings of the Company for the year ending 31st December, 1873, amounted to £223,323, the working expenses to £48,992, and the repair and maintenance of the cables to £14,116. Interest on debentures and income-tax have absorbed a further sum of £3,239, leaving a balance of profit for the year of £156,974. Three interim dividends of 1½ per cent. each, aggregating £69,887, have already been distributed, and there now remain £87,087 for appropriation. The Directors now declare a further dividend of 2 per cent., free of income-tax, making a total of 6½ per cent. for the year, which will absorb £39,950, leaving a sum of £27,137, which will be carried to the reserve fund, thereby raising it to £41,554. The debenture debt, which at the commencement of the year amounted to £17,100, has been reduced to £13,100, by taking up the bonds as they become due.

THE Postmaster-General of Great Britain, Lord John Manners, has definitely refused to reduce the price of telegrams to sixpence.

CUBA SUBMARINE TELEGRAPH.

The fifth ordinary general meeting was held at the London Tavern on Monday, March 23; Mr. Thomas Hughes in the chair. The Chairman, in moving the adoption of the report, which was given last week, referred to the circulars which had been sent round by two or three of the shareholders, and said that the Directors had not replied to those circulars, thinking it best that the shareholders should settle their own future in their own way. He was happy to say that they had now come pretty nearly to an end of their troubles in connection with the repairing of the cables. The shareholders would remember that the first cheering news came exactly a month ago, upon which day the Directors received intelligence that the cable had been perfectly repaired up to Cape Cruize. He was happy to say that a telegram had since been received, dated March 22, stating that the expedition had arrived at Cienfuegos, and that the cable was perfectly repaired up to that point. They might hope, therefore, that in a few days the cable would again be in full working order. Referring to the finances of the Company, he said that on previous occasions the shareholders had expressed their approval of the financial policy of the Directors, and that policy the Directors intended to continue in future. The Directors proposed to carry the whole amount of £4,288 to the reserve fund specially applicable to the payment of the expenses connected with the repair of the cable, the Directors being unable as yet to state what expenses the Company would be put to for these repairs. Referring to the question of amalgamation, which had been prominently suggested in one or two of the circulars which had been sent round to the shareholders, he pointed out that this Company's line was a most important link between two large independent telegraphic systems, and expressed his belief that the time would shortly come when the value of the Cuba Company's property would greatly increase, and when, no doubt, in case of an amalgamation with any other company, good terms would be obtained. He moved the adoption of the report and accounts. Mr. Alex. F. Low seconded the resolution. Mr. W. Abbott referred to the advantages which would accrue to the Company from amalgamation with one of its powerful neighbors, and expressed a hope that the Directors would keep this subject before them. After some further discussion the resolution was put and carried, and the meeting broke up.

THE cables between Santiago de Cuba and Havana having been repaired, direct communication between the West Indies, New York and Europe, has been formally opened.

THE Directors of the Globe Telegraph and Trust Company have declared an interim dividend of 3s. per share on the preference shares, for the quarter ending the 18th of April, 1874, and of 5s. per share on the ordinary shares, being at the rate of 5 per cent. per annum for the six months ending the same date.

THE Directors of the Eastern Telegraph Company have announced the usual interim dividend of 2s. 6d. per share for the quarter ending the 30th of December.

THE traffic receipts of the Great Northern Telegraph Company for the month of March amounted to £14,674, and for March, 1873, £10,620, showing an increase of £4,054. The total receipts for the three months ending the 31st of March last amounted to £39,097, and for the corresponding period in 1873, to £24,578, showing an increase of £14,519.

THE report of the Direct United States Company shows that 1,536 nautical miles of the cable have been manufactured, and that landing places in Newfoundland, Nova Scotia, and New Hampshire, in the United States, have been selected, as also a suitable site in Ireland for the shore end. It is added that the new cable steamer, Faraday, built to the order of the contractors, of 5,000 tons burden, will be moored off Messrs. Siemens's works, at Woolwich, for the reception of the cable on the 15th of April. The subscribed capital of the Company is £1,300,000, of which £1,056,521 is paid up.

THE India Rubber, Gutta Percha and Telegraph Works Company have received news of the completion of the direct submarine cable between Marseilles and Barcelona, laid from their steamship Dacia. This reopens communication between Spain and the rest of Europe, hitherto interrupted by the destruction of the land lines in the districts affected by the civil war. The line will be opened for traffic shortly.

THE Submarine Cable Trust Company announce that the coupon attached to their certificates for six months' interest, at the rate of £6 per cent. per annum, due April 15th will be payable to Messrs. Glyn, Mills & Co. on that day. After providing for the coupons and expenses of the trust, the surplus revenue for the current financial year ending April 15, 1874, would enable the trustees to redeem 88 certificates of the nominal value of £8,800.

As some misapprehension seems to prevail with reference to the declaration of an interim dividend of but 1½ per cent. for the first quarter upon Anglo-American stock, it may be worth while to point out that this interim payment has been made in response to the unanimously expressed wish of the shareholders, at the last annual meeting, that quarterly dividends should be paid by way of interest, leaving the balance of profits to be divided at the end of the financial year. The Board have decided to hold half-yearly meetings, thus responding still further to the wishes of the proprietors.

MR. THOMPSON, Superintendent of the Indian telegraph lines, in a letter with reference to compound words in Indian telegrams, says: "It is not desired to interfere with the sender's choice of words further than to check a practice which has become general of joining together syllables and words having no legitimate connection, or introducing long foreign words into English messages with the object of evading payment of the full charge."

ON Friday, March 27, a new telegraph cable was laid in the Firth of Forth, between Granton and Burntisland, in place of the principal cable, which was destroyed, some time ago, by a ship riding at anchor running foul of it. The new cable, which is of great strength, was made by the Silvertown Cable Company. The cable was brought to the Firth of Forth by the screw steamer International, and was laid under the direction of Mr. Lumsden, engineer; Mr. Tansley, chief telegraph engineer for Scotland; and Mr. Lessels, divisional engineer.

TELEGRAPH communication was established between Malva and Los Angeles, Chili, March 5.

THE Guayamas, Mexico, paper of February 25th says the wire and all required instruments for a telegraph line from Mazatlan to Uris, in Sonora, had arrived in the City of Mexico, and the construction of the line will hardly be delayed a great while. A connection ought soon to be made from Tucson, Arizona, to Uris.

THE new government or administration in Queensland, among other important reforms in the colony, promise a reduction in telegraph charges.

TARIFF BUREAU.

SEMI-MONTHLY CIRCULAR.

EXECUTIVE OFFICE,
WESTERN UNION TELEGRAPH COMPANY,
145 BROADWAY, NEW YORK.
May 1, 1874.

To all Offices on W. U. Lines:

The following changes and additions have been made since the date of the last circular:

GENERAL INFORMATION.

The attention of offices is called to the fact that half rate messages are taken for and received from offices of the Montreal Telegraph Company. Complaint has been made that many of our offices at present accept only *full rate* messages for and from that Company.

Mountain View, Cal., is now an other line office; "tariff for other lines" 30 10 from San Francisco.

Cobalt, Conn. is now a W. U. office, square 29; check direct. The P. O. A. of Monticello Junction, Fla., is Drifton, Jefferson Co.

Raum, Ill., closed.

The P. O. A. of Morton, Cook Co., Ill., is Niles Center, and of Grayland, Ill., it is Irving Park instead of Jefferson.

Nora Springs, Iowa, is an other line office; "tariff for other lines," 75 and 5 from Chicago, Ill.

Troy Junction and Troy, Kas., are two names for the same place; check messages to Troy Junc.

Fort Riley, Kas., closed.

Petersburg, Ky., square 301, is in Christian Co.; P. O. A. is Williams P. O.

Messages for Petersburg, Boone Co., Ky., should be sent to Lawrenceburg, Ind., from which point they will be delivered by messenger. Charges for delivery, 75 cents.

Lafourche, La., closed (temporarily).

The extra tariff of 10 cents per message on business to Dexter, Me., will not be charged hereafter.

Gaylords, Mich., closed. Business may be sent and checked to Otsego Lake, Otsego Co.

Bigbee, Mo., changed to Guthrie.

Schuyler, Neb., is now a W. U. Office, square 512; check direct. Offices west of New Brunswick are hereby notified that St.

Stephen, N. B., now in square 4, will, on and after May 11, 1874, be in square 8.

Business for Newtown, N. J., will hereafter be checked to Hightstown.

Still Valley, N. J., closed.

Black Rock, N. Y., is also known as North Buffalo. "Tariff to the same for other lines" is now 10 and 1 from Buffalo.

Westport, N. Y., reopened.

Messages for the Hudson River Insane Asylum, near Poughkeepsie, N. Y., are delivered from the latter place at a charge of 50 cents per message if delivered during the day, and one dollar after 6 o'clock P. M.

E. Emerald, O., square 241, is in Paulding Co.; P. O. A. is Emmett.

The P. O. A. of Burgettstown, Pa., is Cardville.

Tarr Farm, Pa., closed.

The P. O. A. of Salem, W. Va., is New Salem, Harrison Co.

The following is a list of offices on the Chesapeake and Ohio Telegraph line, in W. Va., with "tariff for other lines" from Huntington and Greenbrier, W. S. Springs:

Alderson,	50	3	Huntington,	25	2	Greenbrier, W. S. Spgs.
Barboursville,	25	2	"	50	3	"
Brownstown,	45	3	"	50	3	"
Charleston,	40	3	"	50	3	"
Kanawha Co.,	40	3	"	50	3	"
Coalburg,	45	3	"	50	3	"
Cannelton,	50	3	"	50	3	"
Diamond,	50	3	"	50	3	"
Fort Spring,	50	3	"	25	2	"
Guyandotte,	20	2	"	50	3	"
Hinton,	50	3	"	40	3	"
Hawk's Nest,	50	3	"	50	3	"
Hurricane,	30	2	"	50	3	"
Kanawha Falls,	50	3	"	50	3	"
Meadow Creek,	50	3	"	40	3	"
Milton,	25	2	"	50	3	"
New River Falls,	50	3	"	40	3	"
Quinsimont,	50	3	"	40	3	"
Ronceverte,	50	3	"	25	2	"
Scott,	35	3	"	50	3	"
St. Albans,	35	3	"	50	3	"
Swell,	50	3	"	50	3	"
Talcott,	50	3	"	30	2	"

The P. O. A. of Lake, Wis., is 148 Chicago street, Milwaukee; of Western Union Junction, Wis., Racine P. O.; of Truesdell, Wis., Kenosha P. O., and of Burr Oak, Wis., Somers, Kenosha Co.

NEW OFFICES.

406 Nora Junction, Iowa.

254 Harrodsburg, Ky.

19 Carp River, Mich.

378 Frankford, Mo.

89 Guthrie, Mo. (formerly Bigbee.)

59 Valley Station, N. J. P. O. A. is Bethlehem.

170 Oneida, O.

* Hopewell, Bedford Co., Pa. 30 3 119 Huntingdon, Pa.

* Tatesville, " " 30 3 119 " "

180 Youngville, Pa.

330 Edgar, Tenn.

330 Idlewild, Tenn.

330 Medina, Tenn.

490 Milano, Texas.

366 De Soto, Wis.

548 Fort Russell, Wy. Check Cheyenne.

ATLANTIC CABLE BUSINESS.

"Supplement to the Tariff Book" No. 5, page 21, second column, under "Atlantic Cable Business," says (incorrectly) that the words which indicate the route of messages are not charged (or beyond London or France. The words "via Siberia," on messages to China and Japan should be charged for throughout.

On page 22 (of the same supplement), first column, instead of "Germany, except Baden and Wurtemberg," read: *Germany, except Baden, Wurtemberg and German Alsace and Lorraine—\$1.10.*

The rate for 20 words or less to German Alsace and Lorraine is \$1.50.

We are notified that the Cable between Saigon and Hong Kong is repaired. Messages for China and Japan will be forwarded as heretofore.

WILLIAM ORTON, *President.*

EXECUTIVE OFFICE
WESTERN UNION TELEGRAPH CO.,
NEW YORK, April 28th, 1874.

The Complimentary Franks of 1873 are hereby continued in force until the first day of June, 1874.

GEO. H. MUMFORD,
Vice-Pres't.

TRANSFER SERVICE.

EXECUTIVE OFFICE,
NEW YORK, April 20th, 1874.

To all Transfer Agents:

Until further notice, Mr. George E. Netherland, of Houston, Texas, will act as Transfer Agent of the district heretofore in charge of Mr. D. P. Shepherd.

GEO. H. MUMFORD,
Vice-Pres't.

THE TEXAS MILITARY LINE.

In the House of Representatives on Monday, April 20th, Mr. Giddings of Texas moved to suspend the rules and pass a bill for the better protection of the frontier settlements of Texas against Indians and Mexican depredations by the construction and maintenance of a line of telegraph from the City of Denison, Texas, to Fort Sill, Indian Territory, and thence along the northern frontier line of the settlements, and by the various military posts, to Brownsville, and appropriating \$100,000 for that purpose. The motion was agreed to, and the bill was passed.

The shares of the Gold and Stock Telegraph Company have recently been admitted to what is termed the free list of the New York Stock Exchange, and will be quoted and dealt in at the Board hereafter. The capital stock amounts to \$2,500,000, each share being \$25 fully paid. The floating debt of the Company amounts to \$199,172.74. The gross earnings for the fiscal year ended August 31, 1873, were \$641,977.64; the gross expenses, \$397,084.17; leaving a balance to income account of \$244,893.47. The registry of the Company is the Union Trust Company.

THE TELEGRAPHERS' MUTUAL BENEFIT ASSOCIATION.

ASSESSMENT No. 61, ISSUED APRIL 24, 1874.

DEATH OF GEORGE H. EVERETT.

George H. Everett (certificate No. 1,719, issued Dec. 9th, 1872), died at Fremont, O., March 26, 1874, of consumption.

Members holding certificates numbered up to and including No. 2,194 will please remit for above assessment.

Attention has been called to the last line on page 12 of the By-Laws. Some members understand by it that they must remit direct to the Secretary. The line referred to should be erased; its publication was a mistake.

ACKNOWLEDGEMENT OF ASSESSMENTS 58, 59 AND 60, UP TO AND INCLUDING APRIL 20, 1874.

4, 5, 6, 13, 23, 26, 28, 33, 55, 58, 65, 70, 72, 74, 75, 80, 89, 93, 97, 101, 103, 108, 114, 120, 122, 131, 140, 141, 143, 144, 146, 148, 153, 171, 175, 179, 183, 189, 190, 191, 193, 197, 198, 215, 227, 230, 235, 240, 247, 248, 274, 303, 342, 344, 351, 361, 372, 380, 391, 392, 393, 402, 405, 413, 430, 431, 441, 466, 468, 469, 470, 471, 475, 476, 484, 511, 512, 514, 516, 553, 554, 556, 560, 561, 573, 575, 584, 590, 604, 618, 622, 642, 646, 648, 649, 652, 663, 664, 665, 669, 685, 694, 701, 708, 714, 729, 735, 737, 741, 750, 751, 756, 764, 769, 790, 803, 808, 809, 812, 820, 830, 831, 848, 855, 871, 873, 883, 901, 905, 922, 927, 930, 931, 939, 941, 943, 952, 976, 978, 980, 991, 992, 998, 1000, 1002, 1005, 1023, 1040, 1047, 1058, 1074, 1075, 1076, 1080, 1093, 1100, 1101, 1102, 1127, 1147, 1149, 1152, 1154, 1155, 1156, 1157, 1159, 1160, 1162, 1167, 1185, 1191, 1196, 1210, 1217, 1224, 1232, 1233, 1241, 1255, 1266, 1274, 1276, 1277, 1282, 1288, 1304, 1307, 1308, 1309, 1311, 1312, 1313, 1314, 1315, 1317, 1318, 1319, 1320, 1321, 1322, 1329, 1340, 1342, 1344, 1345, 1346, 1348, 1349, 1350, 1351, 1352, 1358, 1366, 1372, 1373, 1385, 1387, 1389, 1390, 1391, 1415, 1417, 1418, 1421, 1427, 1431, 1437, 1438, 1449, 1457, 1458, 1470, 1481, 1483, 1484, 1485, 1497, 1500, 1501, 1503, 1508, 1511, 1513, 1515, 1524, 1527, 1537, 1546, 1552, 1554, 1555, 1563, 1564, 1569, 1573, 1576, 1580, 1582, 1586, 1591, 1593, 1594, 1596, 1620, 1623, 1625, 1630, 1632, 1644, 1650, 1652, 1666, 1672, 1707, 1714, 1718, 1719, 1720, 1721, 1729, 1730, 1732, 1737, 1755, 1791, 1794, 1795, 1796, 1797, 1799, 1802, 1804, 1815, 1818, 1823, 1824, 1847, 1852, 1863, 1864, 1881, 1900, 1901, 1903, 1921, 1922, 1924, 1926, 1943, 1951, 1957, 1994, 1996, 1997, 2004, 2015, 2022, 2024, 2025, 2026, 2033, 2040, 2057, 2065, 2074, 2075, 2077, 2083, 2084, 2089, 2094, 2101, 2106, 2109, 2113, 2114, 2116, 2119, 2123, 2125, 2134, 2136, 2137, 2138, 2141, 2142, 2143, 2144, 2147, 2148, 2152, 2154, 2162, 2165, 2170, 2172, 2181, 2180.

ASSESSMENT NO. 61.

4, 6, 16, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 46, 47, 48, 49, 50, 51, 52, 53, 54, 55, 56, 57, 58, 59, 60, 61, 62, 63, 64, 65, 66, 67, 68, 69, 70, 71, 72, 73, 74, 75, 76, 77, 78, 79, 80, 81, 82, 83, 84, 85, 86, 87, 88, 89, 90, 91, 92, 93, 94, 95, 96, 97, 98, 99, 100, 101, 102, 103, 104, 105, 106, 107, 108, 109, 110, 111, 112, 113, 114, 115, 116, 117, 118, 119, 120, 121, 122, 123, 124, 125, 126, 127, 128, 129, 130, 131, 132, 133, 134, 135, 136, 137, 138, 139, 140, 141, 142, 143, 144, 145, 146, 147, 148, 149, 150, 151, 152, 153, 154, 155, 156, 157, 158, 159, 160, 161, 162, 163, 164, 165, 166, 167, 168, 169, 170, 171, 172, 173, 174, 175, 176, 177, 178, 179, 180, 181, 182, 183, 184, 185, 186, 187, 188, 189, 190, 191, 192, 193, 194, 195, 196, 197, 198, 199, 200, 201, 202, 203, 204, 205, 206, 207, 208, 209, 210, 211, 212, 213, 214, 215, 216, 217, 218, 219, 220, 221, 222, 223, 224.

ASSESSMENTS NOS. 55, 56 AND 57.

104, 652, 1257, 1600, 1607, 1611, 1642, 1672, 1692, 1699, 1799, 1833, 1835, 1836, 1921, 1922, 1924, 1973, 2015, 2023, 2028, 2101, 2141, 2165, 2170.

MISCELLANEOUS.

53 and 54.—1897.
58 and 59.—2101.
58.—104—2169.
59.—104.

BORN.

LYNCH.—At West Point, Neb., March 29, 1874, to Frank J. Lynch, Manager W. U. Tel. Office, a son.
NORTROP.—At Hyde Park, N. Y., March 5, 1874, to C. W. Northrop, agent and operator, a son.

MARRIED.

DUNKLE—CARNS.—At Confluence, Pa., April 16, 1874, at the residence of the bride's parents, S. K. Dunkle, Manager W. U. Tel. Office, to Miss Ada Carns—all of Confluence. No cards.

DIED.

NORTROP.—At Hyde Park, N. Y., Jan. 22, 1874, Howard S., youngest son of C. W. Northrop, aged 2 years 6 months and 10 days.

ORTON.—On Sunday evening, April 26, of scarlet fever, Samuel Vance, youngest child of William and Susan J. Orton, aged 3 years and 6 months.

THE SURVEY FOR THE PACIFIC CABLE.

The work of surveying the bed of the Pacific for a telegraph cable to Japan is making satisfactory progress. A letter in the N. Y. *Tribune* from a correspondent on the United States steamer *Tuscarora* gives interesting details of the explorations on the line of a great circle between San Diego, California, and Honolulu, Sandwich Islands. Under date of Honolulu, Feb. 8, he writes:

"The undertaking now before us will occupy eight or nine months under favorable circumstances. It is as follows: The determination of the continental outline from the 100 fathoms' line to the ocean bed proper (which is to be considered at 1,500 fathoms depth), from San Francisco to San Diego. Then a line of soundings run on a great circle from that place to Honolulu, and thence to the Bonin Islands, and from there to Yokohama. By that time also the work begun on the great circle route from between Yokohama and Cape Flattery, passing through the Aleutian Islands, will be completed. On the 6th of January we started from San Diego for this place, which we reached yesterday. We encountered only two gales, which occasioned a suspension of work for about five days. Other than this the trip was a most delightful one, and more particularly so from the remarkable and continued success in securing all the important information of which we were in search. The slope of the bed of the ocean to the depth of 1,900 fathoms—which was found in lat. $31^{\circ} 43' N.$, long. $119^{\circ} 28' W.$, at 115 miles from San Diego—averaged about 90 feet to a mile. From that position to lat. $23^{\circ} 10' N.$, long. $150^{\circ} 31' W.$, at which point (1,750 miles from San Diego) the greatest depth was found, the slope is three feet to a mile; while from that position to Honolulu (about 400 miles) the slope is 45 feet to a mile. At a point within about ninety miles from Honolulu, in lat. $21^{\circ} 43' N.$, long. $156^{\circ} 21' W.$, a depth of 3,023 fathoms was found. From that point the bottom shoaled rapidly to 498 fathoms in lat. $21^{\circ} 26' N.$, long. $157^{\circ} 19'$, at only 56 miles distance, this slope thus averaging 250 feet to a mile. The greatest elevation in mid-ocean was in lat. $26^{\circ} 30' N.$, long. $127^{\circ} 37' W.$, and was, in fact, the only one worthy of mention. The depth was 2,500 feet less than at the succeeding cast, which was taken at 50 miles distance, making the slope 60 feet to a mile. This I mention, however, only as the extreme case, as the plateau cannot be regarded otherwise than wonderfully regular. The greatest depth attained was 3,053 fathoms (18,318 feet). The average depth of the ocean bed of the Pacific has been theoretically determined by the researches of the Coast Survey to be about 2,400 fathoms. This we have corroborated practically, considering that portion as the bed which is below 1,800 fathoms.

In this cruise 62 casts were taken at an average of every 38 miles. A yellowish-brown mud or ooze was brought up from the bottom at each cast, and was bottled and preserved for future investigation and analysis. Careful attention has been given to the taking of serial temperatures at all depths. The temperature of the surface water increased gradually from $59^{\circ} F.$ off San Diego to $74^{\circ} F.$ in the vicinity of the Sandwich Islands. It was generally found that the temperature fell very slowly to about $50^{\circ} F.$ at 100 fathoms' depth near the former place, and to $60^{\circ} F.$ near the latter, defining distinctly the depth of the equatorial current. A more rapid fall takes place at about 300 fathoms; at that depth, throughout the entire distance, the temperature was nearly constant, standing at about $43^{\circ} F.$ Below that there was a steady fall of temperature till the bottom was reached, where the thermometer stood at about

$35^{\circ} F.$ A difference of 400 or 500 fathoms, more or less, in deep water on this line has no influence upon the bottom temperature. In lat. $26^{\circ} 23' N.$, long. $137^{\circ} 22' W.$, in 2,160 fathoms, the bottom temperature was $34^{\circ} F.$, the lowest reading obtained. Taking into consideration the Cape Flattery line of soundings, as well as this, the bottom temperature of the Pacific is constant at depths ranging from 1,600 to 3,054 fathoms.

But few practical observations of currents were made, owing to the sea being too rough for boat work; still one, if not the prominent, cause of currents was distinctly demonstrated. Within a few hundred miles of the Sandwich Islands we experienced a long, heavy sea, for two or three days, from the westward, the result of a heavy gale. During this time, notwithstanding we were in the equatorial current which sets to the westward, we were carried by the current in nearly an opposite direction about four knots an hour. The wind was light and from the eastward. Casts are now taken in three miles' depth of water with as little difficulty, and as satisfactory results, as in shoal; a fact which is sufficient to demonstrate the perfection of the apparatus used. Over 5,000 miles have been traversed, and soundings constantly made with the same length of wire, which is still in good condition. It would be difficult, and, in fact, thus far impossible, to decide which of Commander Belknap's three sounding cylinders was the best adapted to the service required, as the action of each seems perfect.

It is, perhaps, too soon to discuss now the relative merits of this proposed route or to attempt to compare it with the Cape Flattery line, the survey of neither being as yet fully made; still, I am forced to believe that sufficient data have been obtained even now to indicate the probable results of future investigations. The strongest, and I think the only arguments, in favor of the northern route for a telegraphic cable, are the regularity of the plateau and the comparatively light expense, owing to the small amount of cable required, on account of there being less depth and distance between the initial points. In favor of the other route must be considered the local traffic of the South Sea Islands, and especially of Australia, which is now directly in telegraphic communication with Singapore, by way of the Island of Java, and thence westward through the Red and Mediterranean Seas. No difficulty would be experienced in laying a cable over the southern line, since fair winds and good weather almost invariably prevail; and no difficulty would probably occur in dredging for it in case of a break at any time, while at the north the Summer months would be the only ones in which such work could be successfully undertaken."

ACTION OF LIGHT ON THE ELECTRIC RESISTANCE OF SELENIUM.—M. Sale, in experimenting on the electric conducting power of selenium, which varies with the degree of light to which it is exposed, says that, after careful experiments, he concludes that the effect of the light is not produced by the chemical rays, since the maximum of diminution is observed in the maximum point of the red rays. Neither is the change in the resistance due to an augmentation in the temperature. While the effect also of the light is sensibly instantaneous, the return of the selenium to its normal resistance after the light is cut off is not so rapid. Finally it appears that there exists in the red rays, which are the most intense in heating properties, a power which, without modifying the temperature, changes the molecular conditions of the particles.

A MARRIAGE BY TELEGRAPH.

On Thursday, April 16, a minister in the Keokuk, Iowa, office of the Western Union Telegraph Company married a couple at Bonaparte, Iowa, he performing the ceremony and they pronouncing the marriage vow over the wire. Five o'clock was the hour fixed for the ceremony, and precisely at that time a dispatch was sent to Keokuk to the effect that the candidates were at the telegraph office in Bonaparte, and ready to proceed. The following was then sent:

KEOKUK, Iowa, April 16th, 1874.
JOHN SULLIVAN and FRANCES GODOWN,
Bonaparte, Ia.:
Please join hands and take the pledge.
WM. C. PRATT.

The following is a copy of the pledge which had been left with them:

You mutually and solemnly promise before God and the witnesses present, that you will each take the one you hold by the hand to be your lawful and wedded companion. That, forsaking all others you will cleave to each other in sickness and in health, and perform all the duties of a faithful companion until you are separated by death. If to this you agree, send me a message to this effect.

Then came the response:

BONAPARTE, April 16, 1874.
WM. C. PRATT, Keokuk.
We take the pledge.

JOHN SULLIVAN,
FRANCES GODOWN.
The concluding dispatch was then sent as follows:
KEOKUK, Ia., April 16, 1874.
JOHN SULLIVAN and FRANCES GODOWN,
Bonaparte, Ia.:
By authority I pronounce you husband and wife, and may God bless you.
WM. C. PRATT.

The operators all along the line then tendered their congratulations to the happy couple upon their marriage by the lightning process.

We believe that this is the first authenticated marriage ceremony performed through the medium of the telegraph. Managers Dolbear of Keokuk and Detweiler of Bonaparte were the officiating telegraphists.

THE FUTURE OF THE UNITED STATES.

The Americans of the United States, whatever they do, will become one of the greatest people of the earth; they will cover with their offshoots almost all North America. The continent which they inhabit is their domain; it cannot escape them.

There will arrive a time when there will be seen in North America 150,000,000 of men equal together, who will all belong to the same family, who will have the same point of departure, the same civilization, the same language, the same religion, the same habits, the same manners, and over which thought will circulate in the same form and paint itself in the same colors. All else is doubtful, but this is certain. Here is a fact entirely new in the world, of which imagination can hardly seize the extent.—*De Toqueville, in 1831.*

"A MOLECULE of a substance is a small body such that if, on the one hand, a number of similar molecules were assembled together, they would form a mass of that substance, while on the other hand, if any portion of this molecule were removed, it would no longer be able, along with an assemblage of other molecules similarly treated, to make up a mass of the original substance. Every substance, simple or compound, has its own molecule. If this molecule be divided, its parts are molecules of a different substance or substances from that of which the whole is a molecule. An atom, if there is such a thing, must be a molecule of an elementary substance."

Journal of the Telegraph.

This Journal is issued on the 1st and 15th of each month. Its circulation is over 8,000. It goes to every State, Territory and Province on the Continent. It has become a necessity, and is always welcomed as a friend. No better medium for advertising exists.

TERMS:

TWO DOLLARS PER ANNUM IN ADVANCE.

Address—

JOURNAL OF THE TELEGRAPH,
Western Union Telegraph Company,
145 Broadway, New York.

NEW YORK, MAY 1, 1874.

WE regret to learn of the death, on Sunday evening last, the 26th ultimo, by malignant scarlet fever, of Samuel Vance Orton, son of President Orton, at the family residence, New York, after an illness of one day. The deceased child was three years and six months old, a beautiful boy, and his death will be a great blow to the parents, now in Europe, by whom he was very tenderly loved.

ANOTHER POSTAL TELEGRAPH SCHEME.

Senator Edmunds has introduced, in the Senate, a bill for the creation of a Commission on the Postal Telegraph. The bill authorizes the President to appoint a Commission, consisting of an army officer of no lower rank than a lieutenant-colonel, a naval officer not less in rank than a commander, and a private citizen expert not connected with any telegraph company, to make inquiry on the general subject, and report to Congress as to the desirability of establishing a postal telegraph system in this country.

DURING the local faction fight for political supremacy at Little Rock, Arkansas, one of the contending parties proclaimed martial law, under which, on April 16th, the Western Union Telegraph Office was seized and a vigorous censorship applied to all telegrams. This state of things existed for some days, when the Federal authorities interfered to the extent of restoring the telegraph to its normal condition.

MANAGERS of offices will please take notice that in accordance with the rules all free messages originating at and sent from every office during the month, excepting those upon the business of any railroad company entitled to go free between points on the line of its own road, or those upon the business of the Western Union Company, must be included in and accompany the monthly report of such business. Some offices do not comply with this regulation. It is also important that the business should be properly classified according to the forms furnished to offices. This is not always correctly done.

THE color for the complimentary stamps for 1874 is brown.

PROFANITY ON THE WIRES.

In a lengthy communication received from a very intelligent correspondent we find the following remark in connection with a criticism on Rule 17: "There is more profanity used by the employés of the Company while on duty in the hearing of other employés in one day than will be offered at the counter in messages from now till eternity."

This is a strong sentence, and the dates somewhat startling. The positiveness of the statement affords some evidence of its truth. It is, indeed, rarely that a person intelligent enough to use the telegraph, which of itself implies a touch of civilization, offers a message the profanity or beastliness of which compels rejection. Yet, unfortunately, there is a class of men, usually young, always mean, always coarse, ready to place upon the wires messages containing profane and indecent expressions, against whom a company has to stand guard. Our correspondent staggers our respect for him by proposing to let such people have equal rights with decent men. We shall not soon forget the time when the case was first presented to the now absent President of the Company, in a message not remarkable for its grossness, yet too indecent for a gentleman to read without instinctive anger. "That message must be rejected, no matter what the consequences may be to the Company," was his answer. We trust the rules may so stand even to eternity.

We accept the other statement of our correspondent hesitatingly and with regret. We have believed that the telegraph staff of the United States had become too elevated in its general character for such a charge to be true. We believe the day will come when it can be safely resented as a slander. The telegraph system of this great nation deserves and requires men of character for its work, and we know that a large majority of the fraternity are gentlemen by nature and education. None other will, some day, be allowed to touch its keys. We think there cannot be many now who are open to the charge of profane or indecent use of the wires, although it must ever be too much to expect that under the good exterior which nature sometimes gives to her small children, the mean and vile can always be kept out.

Assuming what our correspondent says to be true, an evil exists which can only be rooted out by a single but effectual process. The time will come, when men addicted to cursing and indecency on the wires will have a little lightning put upon them at the Executive desk. This latter we would like to see. We claim a little tenderness of heart. We don't like to see a dog kicked. We would not needlessly "set foot upon a worm." But we would be glad to have any dirty scoundrel who can send his foul breath across the wire before the eyes of pure girls and good men, taken by the ear and given to the broad mercies of the curb. If that be cruelty, make the most of it.

One word more. Our correspondent says, "I have seen men tear up a message and walk off because refused on account of profanity contained therein. For whose delicate immaculate sakes do we refuse to

transmit profanity and obscenity?" We confess ourselves ashamed to make the quotation except that it assures us of what he elsewhere denies, that the rules of the Company are respected. Any company should be proud to know that a man cannot use its facilities to do that which, in any man, is both disgraceful and degrading.

THE CUBA CABLE OF 1873.

The Cable from Key West to Havana which was laid in 1873, some weeks since failed to work. Tests show the fault to be about 12 miles from Key West. Mr. George B. Prescott, Electrician to the Company, accompanied by Mr. Wm. Mackintosh, Foreman of Repairs, sailed on Saturday, April 18th, on the steamer *City of Waco*, for Key West, for the purpose of underrunning the cable and removing the fault. They arrived on the 23d, but up to the time of writing this article nothing has been accomplished, owing to unfavorable weather. The Secretary of the Navy directed Admiral Scott to place one of the vessels attached to the squadron at Key West at Mr. Prescott's service, and with this vessel an attempt was made on the 25th to underrun the cable, but the party were obliged to return on account of bad weather.

NEW MUSIC.

We have received from the composer a well written song and piece of music, entitled "While O'er the Sea." Words by C. D. Stanford; music by J. H. Milliken, both operators in the Boston office of the Western Union Company.

GOVERNMENT AND THE TELEGRAPHS.

We have been so long accustomed to hear of the vast benefit which society is to reap when Government takes possession of the railways, that one becomes curious to know what has been the result of their administration of the telegraphs. Well, certainly, after all that has been said in the way of blowing the trumpet of Government management, it is a matter of surprise to find that recent investigations have shown that their management of the telegraphs—a matter far more simple than that of the railways—has been anything but one of an encouraging character. Some time since, we called attention to the fact that, although three or four years have elapsed since the Post-Office authorities took possession of the telegraphic lines of the country, the Treasury has not, as yet, paid the railway companies for the surrender of those lines which belonged to them. We have heard chairman after chairman, at the recent half-yearly meetings, state that all attempts to obtain a settlement of their claims have been futile.

We know that last year a good deal of scandal was created owing to the officious zeal of a gentleman connected with the telegraph department in applying towards its development a sum of money belonging to the Post-Office revenue, and not condescending to wait for the constitutional sanction which is considered essential to the good government of public offices. The Post-Office is again this year the milch cow of the Telegraph Department, for we

find in a report just presented to Parliament that, practically, it is the Post-Office which defrays the salaries of the officers engaged in that department. It further appears that, notwithstanding this friendly aid, the telegraphic net receipts have fallen short by £1,000 per week of the amount required to pay the interest on the purchase money. The original cost of taking over those lines was £8,000,000; but, as we have on a previous occasion shown, it is not likely to be less than £12,000,000, so that unless a considerable increase takes place in the telegraph business the deficiency each week is likely to be much larger than it is at present. A good deal has been said of the tendency of railway companies to cook their accounts, and charge to capital what ought to be borne by revenue; but it will be seen, from what we have already stated about the salaries of the officials in the Telegraph Department, that the Government have rapidly become adepts in the system of making things pleasant. To show this a little more in detail, we quote the report of the Comptroller and Auditor-General. Mr. Scudamore, as manager of the department, receives a salary of £300. Hearing this, one is inclined to protest against the injustice of paying such an officer as the manager of a great State department the salary of a second or third-class clerk in an ordinary counting-house; but then Mr. Scudamore draws from the Post-Office a salary of £1,500 per annum really for doing telegraph business. The Telegraph Department ought, in this case, to pay £1,800 per annum instead of £300, but then that would interfere with the object which the authorities have in view, of showing how cheaply they can manage things. Again, Mr. Chetwynd receives a salary of only £25 from the Telegraph Department, but the Post-Office makes up his salary to an amount worthy of his position. It is just the same thing in respect to the salaries of the bookkeeper (£100 per annum), and of chief examiner and cashier (£75 per annum each). The Auditor-General says he cannot think, however, that the known valuable services of these gentlemen in connection with the Telegraph Department are fairly represented by such payments. It is just the same with respect to new buildings as it is with respect to the salaries—the Post-Office bears the brunt, and the Telegraph Department escapes almost scot free. The Auditor-General says:

"Under the votes for 'Post-Office and Inland Revenue Buildings' considerable expenditure has for some years past been charged in respect of the building of the new Post-Office, St. Martin's-le-Grand. In this building accommodation is provided not only for the officials of the Post-Office, but also for the very numerous staff of the Central Station of the Telegraph Department, but no charge in respect of this expenditure has been raised either against the telegraph votes or the telegraph capital, in the accounts submitted to me for examination; neither am I aware whether it has been taken into consideration in the annual account presented to Parliament under the provisions of the Telegraph Act of 1869. It perhaps may be intended to hand over the premises in Telegraph street for postal purposes, and to treat the accommodation thus afforded as an equivalent to that provided for the Telegraph Department in St. Martin's-le-Grand; but even if this should be the case, some independent evidence as to the value of the equivalent would appear to be desirable. It seems to me that I should fail in my duty if I omitted to point out that the Parliamentary account above mentioned undergoes no independent verification by the Exchequer and Audit Department, although it is the only account by which Parliament and the

country are enabled to ascertain how far the telegraph revenue is equal to or exceeds the expenses of the management, the cost of maintenance, and the interest on the debt which the acquisition of the telegraphs has created. To do this with accuracy it would appear to be essential that this account should embrace, not merely the expenditure incurred by the Post-Office itself, but also the expenditure which such acquisition has occasioned in other public departments."

We quite concur in these opinions, for when we hear it seriously proposed that Government should take over the management of the railways it is not to be wondered at if we, on the part of the public, are desirous of seeing what has been the success of commercial departments administered by Government, that we may be able to judge how far the policy of State management, in such enterprises, ought to be allowed to proceed.—*Railway News*.

THE NEW CODE OF RULES.

From Cincinnati, O.

I have been watching the suggestions regarding new rules with much interest. I have charge of all "Error Business" in this District, and have been for a long time impressed with the necessity for a great improvement in rules, and in their enforcement. It seems to me that "the powers that be" do not understand the low capacity of the great mass of operators and the great necessity of making rules simple and plain. I am strongly in favor of a concise and positive set of rules published in connection with something in the nature of a "Manager's Manual," full of explanations and illustrations. I would have this book furnished to each office, and would have each superintendent keep on file a receipt from each manager showing the receipt of this book when first sent out. Whenever an office changes hands, I would have the new manager send in a special receipt for his "Bible," or notification of its absence.

I think, then, the policy of holding all managers responsible for losses, resulting from violation of rules, should be introduced and rigidly enforced.

From some sensible man without date.

More attention should be paid to the ventilation and cleanliness of offices, as one of the necessities to the good health and efficiency of the employes. Smoking in the office could be prohibited with advantage to all.

Count as two words Post-Office, New York, New Orleans, North Carolina, St. Louis, St. Augustine, United States and other words of that kind that are now counted one word.

Designate what offices may omit the name of State in sending business, and require all other offices to invariably give name of State after name of place.

Count abbreviations the same as the words they represent.

When a customer wishes to add a note of instruction to the manager of the office to which his message is being sent, let each note be written after the signature of the message and the words be included in the check.

Parties sending messages frequently wish to say, "Operator, deliver to-night and get answer." "If not there, operator please forward," or give some other instructions that are liable to be misunderstood when put in the body of a message, as is sometimes done.

Forwarded messages to have the words "Forwarded from Pittsburg, April 12th" (or whatever and date it may be) written after the signature and above the check, and the check to say how many extra words counted.

Messages from or to other lines where name of

place and date are not counted to have "via" and the name of the office checked written after the check.

Operators at way offices who cannot read by sound readily should be required to use a register, thus preventing great delay by breaks and questions. This matter should be urged upon the managers of railroad wires.

Operators to exercise more care in sending. Clear, distinct sending is not the rule, as it ought to be. Many first-class operators cannot be called clear, distinct senders.

From Cedar Rapids, Iowa.

ERROR SHEETS.

1st.—There is much time and money thrown away by managers not paying proper attention to inquiries and a great many messages sent to superintendents requesting such and such an office to "answer inquiry" so and so.

Now, I would suggest this as a remedy:

Let there be a specified time set for answers to be returned—say ten to fifteen days. If at that time no answer has been received, let that silence be returned as a voucher for over check.

To guard against managers taking advantage of this rule, and return the "silent" voucher when no inquiry has been made, I would suggest this: that when an inquiry has been sent to the office with which the difference occurs, a DUPLICATE inquiry should be sent to the District Superintendent at same time (let there be blanks same as the present 47 blanks, and word "duplicate" printed on it). When the District Superintendent receives this duplicate, let him notify the office of whom the inquiry is made to answer promptly. Should the office to whom inquiry is sent be out of his district, have him notify the proper official, and keep this error sheet on file until error sheet has been returned to him, then see that the manager has performed his duty.

Let this duplicate inquiry and Superintendent's notice be sufficient. After managers have paid for their "silence" a few times, they will pay more attention to inquiries; furthermore, it will stop this office message business and waste of postage, and, I think, have a tendency to "hurry up" error sheets.

2d.—I would suggest prepayment on all business (not covered by franks or passes), or if that system cannot be adopted at present (the time is coming when prepayment will be demanded), would have the word "guaranteed" follow check of a collect message, unless same should be an answer; then words "an answer" should follow check.

3d.—A great many Government messages have to be forwarded to U. S. Marshals and their deputies. Question is, should they be forwarded at Government rate or full rate? I think full rate is proper one to forward it on, because the Government poliah has worn off when message has reached destination first intended.

From Bay City, Mich.

Allow me to offer a few "stationery" suggestions. Blank No. 1 can and should be improved. It should present a neat and comely appearance, as it is ever before the public. Blanks now in use do not give sufficient space between the lines for date and address. A forwarded message, for example, "Kaw-kawlin, Mich., 7, via Sault Ste. Marie, Mich., April 7th," stands a poor show in such close quarters. The latter name and date itself is crowded; it gives no place for "No." or operator's initials. Most offices should receive blanks with name of their office printed thereon, as operators who are in a hurry seldom fill in name of place received at. Such

offices could be supplied with year or two supply printed in this way at little or no additional expense to the Company. Red blanks No. 44 should be arranged same as No. 1. Check ledger needs slight improvement. Open a ledger, and tell us where to write name of the office for each column? That margin at top is "too thin."

Managers of commercial offices should be supplied with letter heads; we now use whatever is handy.

From Iowanda, Ill.

Please allow me to suggest that a rule be made governing the delivery of messages by operators who hold at once the responsible position of manager, chief operator, receiving and delivery clerk, messenger, station agent, or ticket agent, &c., &c., including half-a-dozen other duties. It is a common occurrence for an operator, who is also station or ticket agent, to receive very important business, requiring immediate delivery, just at the time when the train dispatcher wants him to help along a train, or just as the rule of R. R. Co. requires him to open his ticket office—a rule so stringent—"a violation of which shall be considered just cause for dismissal." I recommend that a small amount—say five or ten cents—be collected, by sending operator, unless message is an answer, to pay for delivering, as it is easy any time to hire a boy for that amount to deliver messages a short distance, and will save much worry to the receiving operator, much dissatisfaction to the party addressed, much cursing on the part of the dispatcher and many long letters from the Telegraph Superintendent.

From Louisville, Ky.

DAILY DELIVERY CARDS WITH POUCH AND BELT INSTEAD OF BOOKS.

Inquiries in reference to lost messages, corrections, etc., to be left to the discretion of the Manager, "office messages" deemed unnecessary or improper by receiving or relay offices being forwarded to the District Superintendent for his information, at the close of each day's business, with such indorsement as shall be necessary for investigation.

A rule requiring all offices to register Sunday's business with Saturday's, except when Sunday falls on the first day of the month, in which case enter it with Monday's. The same rule to apply to numbering messages for transmission.

Rule 53 to be rigidly enforced.

From Brewster, N. Y.

"That a rule be printed on fly-leaf, or cover of messenger books, requiring messengers to constantly keep supply of No. 2 blanks for answers, and also showing clearly their duties as messengers, so there will be no excuse for negligence on their parts."

From Norfolk, Va.

I would recommend the adoption of a rule requiring senders of collect messages to pay tolls on the message giving notice of non-collection. This would be no more than just to the Company, and would reduce the number of collect messages. My experience has shown that many messages sent collect could just as well have been prepaid. Many persons send their telegrams collect to avoid a little trouble of making a memorandum of the tolls, and others to ascertain whether the person addressed is found. The message giving notice of non-payment might be addressed direct to the sender. In case of replies to telegrams Managers could return the notification message, properly endorsed, with their account current.

BE JUST.—It is no advantage to have a lively mind if we are not just. The perfection of the pendulum is not to go fast, but to be regular.

THE "SNAPPER" SOUNDER.

PRICE,  30 CENTS.

6 FOR \$1.50.

The most noise for the least money, a companion for every operator, a necessity for every student, a toy for every child.

R. W. POPE,

BOX 5278,

NEW YORK.

Purchasers in Canada will please order from

SMITH & HALL,

Montreal Telegraph Company, } Agents for the Dominion.
HAMILTON, ONT.

Red Star Line

PHILADELPHIA AND ANTWERP.

Appointed to carry the Belgian and United States Mails.

The following Steamers are appointed to sail
FOR ANTWERP.

From Philadelphia.

From New York.

NEDELAND, April 17.
VADEBLAND, April 24.

SWITZERLAND, May 9.
NEDELAND, June 6.

FROM ANTWERP.

For Philadelphia.

For New York.

CYBELE, April 29.
VADEBLAND, May 27.

SWITZERLAND, April 15.
NEDELAND, May 13.

PRICES OF PASSAGE IN CURRENCY.

First Cabin, - - - \$90. Second Cabin, - - - \$60.
Steerage, - - - \$30.

Prepaid Certificates, \$32.

Passenger accommodations for all classes unsurpassed. Ample attendance is provided. Every steamer carries a surgeon and stewards.

Through tickets and through Bills of Lading issued between all prominent points.

For passage, rates of freight, and other information, apply to

PETER WRIGHT & SONS, Gen'l Ag'ts,
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AMERICAN LINE.

The American Steamship Company of Philadelphia.

Weekly Mail Steamship service between

PHILADELPHIA AND LIVERPOOL,

CALLING AT QUEENSTOWN,

Sailing every Thursday from Philadelphia and
Sailing every Wednesday from Liverpool.

The following Steamers are appointed to sail from
Philadelphia.

INDIANA, May 7.
PENNSYLVANIA, May 14.
*KENILWORTH, May 21.

ILLINOIS, May 28.
OHIO, June 4.
ABBOTSFORD, June 11.

PRICES OF PASSAGE IN CURRENCY.

Cabin \$75 to \$100 according to accommodations.
Intermediate, - - - \$40. Prepaid Intermediate, - - - \$45.
Steerage, - - - \$29. Prepaid Steerage, - - - \$31.

Steamers marked with a STAR do not carry intermediate.
Passenger accommodations for all classes unsurpassed. Ample attendance is provided. Every steamer carries a surgeon and stewards.

These Steamers are supplied with Life-Rafts in addition to the usual Life-Boat and Life-Preservers.

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PETER WRIGHT & SONS, General Agents,
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TILLOTSON'S TELEGRAPH INSTRUMENTS.

Imitations of our PREMIUM REGISTERS, RELAYS, SOUNDERS, KEYS, CUT-OUTS, LIGHTNING ARRESTERS, SWITCH BRACKETS, ETC., ETC., are to be found everywhere, but the genuine can always be secured directly from us or our Agents. Notwithstanding the panic of 1873, our factory has been overwhelmed with work, consequent upon the inducements we have offered in the shape of low prices and superior work.

L. G. TILLOTSON & CO.,

8 DEY STREET, NEW YORK.

GLASS CARDS, RED, BLUE, WHITE, Clear and Transparent. Your Name beautifully printed in GOLD on 1 doz. for 50c. post paid, 3 doz. \$1, sample 10c. Must have Agents at every Telegraph Office in America. OUTFITS, 25c.

F. K. SMITH,

Bangor, Maine.

BUY THE BEST.

If you want EQUIPMENT for a TELEGRAPH LINE, order of

L. G. TILLOTSON & CO.

They have the GREATEST VARIETY.

They carry the LARGEST STOCK.

Their PRICES are the LOWEST and QUALITY the BEST.

They guarantee EVERYTHING TO BE AS REPRESENTED.

They always RECTIFY MISTAKES at their OWN EXPENSE.

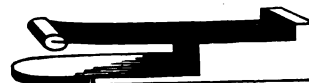
Every ARTICLE required for the CONSTRUCTION and OPERATION of LINES ALWAYS ON HAND.

Their EXCELSIOR TELEGRAPH INSTRUMENT FOR STUDENTS, comprising Sounder and Key, is the greatest success of the times.

L. G. TILLOTSON & CO.,

8 DEY STREET, NEW YORK.

Patent Secured.



A Patent has been this day granted to WALTER J. BARRON, of New York, the inventor of the Metal Base, which has made practicable the flexible spring, discovered ten years since, and of course not patentable, and both of which combined constitute the instrument heretofore known as the "Snapper" Sounder, but to be known henceforth as

The Amateur Telegraphic Instrument,

It being thus designated in the Letters Patent. I have bought of the said Walter J. Barron the EXCLUSIVE right to manufacture and sell, at WHOLESALE and RETAIL, the instrument named herewith, and I hereby CAUTION all persons, under penalty of prosecution for violation of the United States Patent Law, against manufacturing, and against buying or selling, any similar instrument manufactured by any party except myself.

The Amateur Telegraphic Instrument,

which has superseded the Snapper Instrument, in a measure, during the pendency of Mr. BARRON's claim, has a base made of the best metal highly polished, the spring being nickel plated, and capable of producing a clear, pleasant sound. It is an improvement on all that has gone before in the matter of form, finish and

CONSEQUENT DURABILITY.

While a liberal deduction will be made to those becoming authorized agents, the prices given below will be rigidly adhered to, as applied to limited orders:

No. 1, Nickel Plated Spring, and Base of Fine Metal, - 50c.
No. 2, Plain Spring, with Britannia Base, - - - 35c.

Sent, post paid, on receipt of price, to any address in the United States.

Address all orders and letters of inquiry to

JAMES M. FOSTER,

Sole Agent,

(LATE MANAGER AMERICAN DISTRICT TELEGRAPH COMPANY),

P. O. Box 345, Jersey City, N. J.

Jersey City, N. J., May 1st, 1874.

JOURNAL OF THE TELEGRAPH.

VOL. VII. NO. 10.

NEW YORK. MAY 15, 1874.

WHOLE NO. 157.

THE ENGLISH TELEGRAPHS.

By GEORGE B. PRESCOTT.

RATES OF TRANSMISSION OF MESSAGES.

The tolls for the transmission of ordinary messages between any two telegraph stations in the United Kingdom, are as follows: For the first 20 words, exclusive of address and signature, one shilling; 25 words, one shilling and three-pence; 30 words, one shilling and sixpence; 35 words one shilling and ninepence; 40 words, two shillings.

Mr. Scudamore states that the present average cost to the public of an inland message is between one shilling and a penny, and one shilling and a penny farthing, and that before the transfer of the lines to the Government, it was one shilling and seven pence; so that the average reduction on inland messages has been nearly one-third. The Post-Office share of the tariff on foreign messages is so much higher, however, as to bring the average produce to the Post-Office up to one shilling and two pence per message.

RENTALS OF PRIVATE LINES.

The charges for rental of private wires in London are £8 per mile per annum, over house or under ground, and £8 on the roads. In the other parts of the kingdom the charges are £7 and £5.

The prices of the various private wire instruments per set are as follows: A. B. C., £35; Single Needle, £7.10; Printer, £25.

The charge per annum for maintenance and repair of apparatus, the property of the renter, for A. B. C., £1 1s.; for Single Needle, £2 10s.; for Printer, £7 10s.

For hire, including maintenance and renewal, £6, £8, and £10.

For an instrument in a postal telegraph office desk accommodation and clerk's services, £5 5s. per annum.

A charge of 8d. each is made upon messages sent over a private wire for delivery within the local free delivery.

THE PRIVATE WIRE SYSTEM.

The private wire system comprises about 4,000 miles of wire, and produces a gross rental of £27,000 per annum. The private wire business is for the most part confined to London, Birmingham, Bristol, Coventry, Derby, Newcastle, North Shields, South Shields, Sunderland, Manchester, Liverpool, Bradford, Glasgow, Dundee and Dublin. There are, however, many other towns in which private wires run from the postal telegraph stations to the residences or offices of men of business, who are thereby

enabled to send messages for distant parts to the postal telegraph stations by wire instead of by hand. Renters of these pay for the hire and maintenance of them, and also pay the ordinary tariff for the messages sent over them for re-transmission.

The accompanying cuts illustrate the Wheatstone A B C instrument, which is the one most generally used in operating private lines. It consists of two

constantly revolving by means of a handle, and with the other hand presses one of the keys, causing the pointer of the receiving instrument to stop at the letter upon the dial corresponding to the position of the depressed key upon the transmitter.

Daily time signals are sent from London at the following annual rates:

At 10 o'clock, A. M.

For the use of wires and apparatus, including rental and maintenance of a private wire from the Post-Office to the renter's house, a quarter mile in length, £12; a half mile, £14; three-quarters of a mile, £16; one mile, £17.

At 1 o'clock, P. M.

£27, £29, £31, £32.

If the private wire section exceeds one mile the ordinary rates will be charged in addition to the above tolls.

In London the charge for the hourly use of a time wire, within a radius of two miles from the General Post-Office, is £15, and for any distance over two an additional charge of the private wire rate for the extra distance.

INTELLIGENCE DEPARTMENT.

Attached to the Central Office in London there is an Intelligence Department, the duties of which consist in making arrangements for the transmission of news handed in by the various press associations. Press reports are written out in manifold at the various instruments on which they are received, and distributed by the Intelligence Department to the circuits over which they are to be sent to the different parts of the country. The Intelligence Department also looks after the working of the special wires which are leased to certain newspaper proprietors.

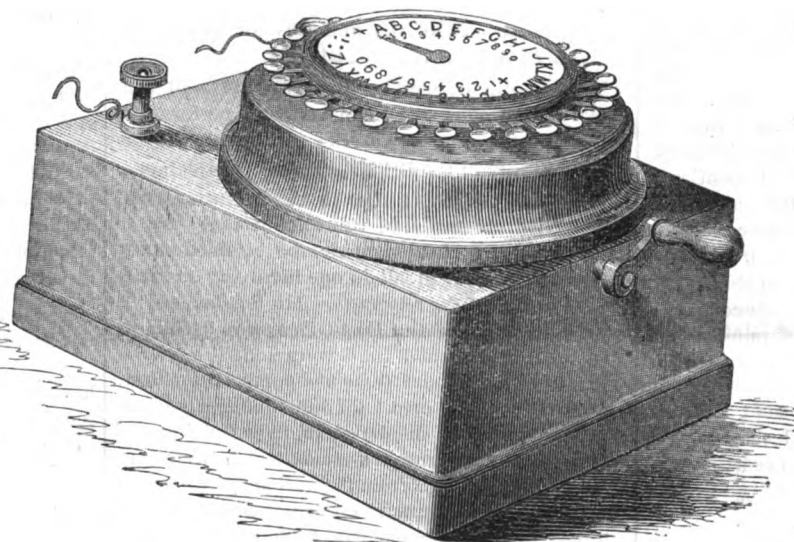
THE SPECIAL STAFF.

The telegraph department employs a Special Staff to attend race meetings, elections or any other gatherings where large quantities of news or messages have to be transmitted from stations, the ordinary force of which is unequal to the sudden pressure of work thrown upon them.

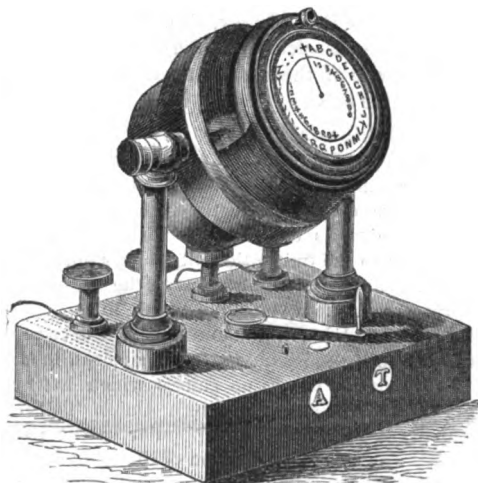
This staff consists of a controller of special arrangements, two superintendents, five assistants, five first class clerks and five second class clerks. The cost of this staff per annum, including salaries and traveling expenses, is about £6,000.

The number of messages sent and received by it in 1873 was 290,651, the tolls upon which amounted to £15,502.

A carriage has been fitted up with instruments, batteries, and all other necessary conveniences for a



Transmitter.



Receiver.

parts—the dial, or indicator, and the transmitter. The hand, or pointer, upon the dial of the receiving portion of the apparatus is driven on the step by step method, by alternating currents from a magneto-electric machine, which is part of the transmitter.

During the operation of signaling the transmitting operator with one hand keeps the magneto

traveling telegraph office, and placed at the disposal of this staff. This office on wheels was used at the West Drayton races and at the Oxford and Cambridge boat race, being stationed on the bank of the Thames at Mortlake, where the race ended. Mr. Scudamore thinks it will be extremely useful on such occasions as the Henley regatta, the English and American boat race, the Eaton and Harrow cricket match at Lords, and the Goodwood races, when it will furnish a convenient office at the entrance to the park, into which the Duke of Richmond has never permitted the wires to be brought.

SCHOOLS FOR INSTRUCTION.

In May, 1870, the department established in London a school for instruction in telegraphy, fitted up with all the apparatus and appliances of a well organized telegraph office, where the learners were taught to send, receive and write out messages in precisely the same manner as in the commercial offices, thus initiating them into the actual business of a telegraph office. The result of this experiment is regarded as highly satisfactory. The number of learners who have entered the school is about 1,000, nearly 800 of whom have been appointed as clerks. The rules of admission to the school provide that pupils must be from 14 to 18 years of age; that not more than eight male and twelve female pupils be admitted at one time; that examinations of candidates shall be competitive; that the educational test shall consist of writing from dictation, copying a statistical table, exercises in first four rules of arithmetic, geography of the United Kingdom; that the medical test shall have special reference to eyesight and hearing; that the number of pupils in the school shall be limited to 20 males and 30 females; that a probationary examination be held at the end of the first month's tuition in the school, and that pupils who then seem likely to fall short of the necessary acquirements shall be required to retire from the school.

THE LONDON SCHOOL.

The establishment of the London School consists of a superintendent, assistant superintendent, or male instructor, matron of female school, assistant matron, and three instructresses. The salaries of these eight employes range from £55 to £210 per annum, the aggregate being £860.

THE PROVINCIAL SCHOOLS.

Schools of instruction are also maintained in various other towns in the United Kingdom, where the rules as to limits of age and medical and educational examination are the same as in London. In the provinces, when a learner can send fifteen words and receive ten words a minute on the single needle instrument, or sounder, or send ten and receive fifteen words a minute on a recording instrument, he is admitted to half a day's duty in the operating room, (in case there are vacancies) at a salary of five shillings per week, and is employed in collecting and sorting messages, posting up the message registers, and other work calculated to give him a knowledge of the general business of the office.

UNIFORMS FOR LINEMEN, MESSENGERS, ETC.

The linemen, inspectors, messengers and porters employed in the telegraph service are supplied by the department with uniforms, which are regarded as necessary aids to discipline.

Twelve inspectors of telegraph messengers are supplied with coat, vest and trousers every eight months; cap, every twelve months; cloak and belt, every three years.

Sixty-seven engineers-in-chief inspectors and three hundred and forty-four linemen are supplied

with coat, hat, and water-proof leggings every twelve months.

Nine hundred and seventy messengers, employed in London, are supplied with tunic and cap every eight months; trousers and boots, and boots repaired, every six months; overcoat, leggings, belt, pouch and sling every three years. Cheverons are furnished to sergeants, corporals and lance corporals.

Two thousand and ten messengers employed in the provinces are supplied with a tunic and cap every eight months; trousers and boots every six months; overcoat, leggings, belt and pouch every three years.

Two thousand four hundred and sixty messengers, employed in delivering telegrams, who are not supplied with uniform clothing, are provided with belt, pouch and arm-badge every three years. These articles are supplied with a view to the identification of the boys as telegraph messengers, when they are engaged in the delivery of messages.

The annual cost of the uniforms for messengers and other employes is about £12,000.

The English Telegraphs, as a rule, are well constructed and efficiently managed, and perform the service of the country to the satisfaction of the great majority of the British public. Complaints of delays, mistakes and failures in the performance of the service are made, of course, but these are to be expected. Perfection cannot be attained in any business, and least of all in one involving so many details as that of the telegraph. Mr. Scudamore, the second Secretary of the Post-Office, who is charged with the management of the Government Telegraphs, is an intelligent, industrious and competent officer, and deserves great credit for the foresight and energy which he has displayed in re-organizing and extending the telegraph systems which were purchased four years ago from the various private companies by whom they were constructed. The plans adopted for carrying out the work of re-organization and extension were intrusted to the officers of the companies which were bought out, the position of Engineer-in-Chief of the Post-Office Telegraphs being given to R. S. Culley, Esq., the former Electrician of the Electric and International Telegraph Company, one of the most competent telegraph engineers in the service.

England is the only country of any importance in Europe where the telegraph and postal systems are under the same control, and the success of the telegraph there cannot be justly regarded as in any manner due to its connection with the Post-Office, but mainly to the unification of the system by placing all the lines under one control, the reduction of the rates, and the extensions of its lines so as to afford prompt telegraph communication between all parts of the United Kingdom. Its success, in short, is attributable to the same causes which have contributed to make the Western Union Telegraph Company so extensive and popular in the United States. The average reduction of the telegraph tolls in Great Britain since the lines were placed under the control of the Government, has not been so great as that made by the Western Union Company during the same period of time, but the small extent of territory covered by the British lines has permitted a uniform rate for all parts of the country, which possesses many advantages not practically attainable in so extensive a country as our own. In order to secure a uniform rate, and at the same time to make the telegraph self-supporting, it was deemed necessary to increase the rates formerly charged for the transmission of messages between stations in the

larger towns from sixpence to a shilling. Complaints of this increase have been made from time to time, and efforts for a lower general rate of tolls have been made, but Mr. Scudamore does not regard a further reduction practicable "unless it be preceded by the execution of vast additional works, for which time as well as money will be required." If the reduction should be made before these additional facilities are furnished the telegraph business of the country would, in his opinion, "be thrown into disastrous confusion."

As I have expressed the opinion that the success of the British Telegraph system is in no degree attributable to its connection with the Post-Office, I must frankly say that in my opinion it could be even better and more economically worked if it were managed as a separate department. In order to unite the two systems it was found necessary to divide the telegraph service into two distinct departments, viz., the Engineering Department and the Traffic Department. The Engineering Department has charge of the construction, reconstruction and maintenance of the plant, including the apparatus. The Traffic Department has charge of the reception, transmission and delivery of the messages, and control of the operators and clerks. The Managers of the Engineering Department embrace the chief employes of the old Companies and are composed of trained experts in the telegraph service. The Managers of the Traffic Department embrace the postmasters and other officials of that department who possess but little technical knowledge of telegraphy.

As the telegraph could not be satisfactorily worked without the technical knowledge which the Postmasters do not possess, Managers or Superintendents having the necessary qualifications are provided for the principal offices, and hence two men are required to be paid for performing a portion of the same service.

Another objection to this system is that the Engineers who are charged with the duty of keeping the lines and apparatus in working order, have no right of control over the clerks who operate them, and thus the Engineer whose duties require him to keep the apparatus in working order, would be overstepping the bounds of propriety if he should either direct an operator to adjust his instrument or instruct him how to do it.

A great deal of difficulty and unnecessary expense arises from this divided control, and no business can be effectually and economically managed under such a system. Another objection to the union of the Telegraph and Postal systems as it exists in England is to be found in the location of the telegraph office in the same buildings with the post-offices. As letters and other postal matter in all the towns in the United Kingdom are delivered by carriers, and pillar-boxes are conveniently arranged for the reception of mail matter from the public, the location of the post-office in the town is of no particular consequence. But the telegraph offices, to be of value, must be situated in the business centres. Now, in order to use the post-office buildings for telegraph offices, a general telegraph office is established at the post-office, and branch offices are located in the centres of business where telegrams are received from the public, and sent either by pneumatic tubes or wires to the general office for transmission to their places of destination. This plan, besides adding unnecessarily to the expense of the service, causes a serious delay, and adds largely to the liability to error.

The following table will serve to show the proportion of messages taken in per week at the post-

offices and branch telegraph offices in the principal towns in the United Kingdom:

	Messages taken in at the Post-office.	Messages taken in at all offices.
Birmingham.....	151	2,601
Brighton.....	221	1,190
Cardiff.....	356	1,408
Grimsby.....	49	568
Hull.....	98	2,366
Liverpool.....	1,927	12,030
Lowestoft.....	34	258
Manchester.....	858	10,461
Newcastle-on-Tyne.....	436	2,466
Portsmouth.....	307	564
Southampton.....	266	808
Swansea.....	192	873
York.....	97	493
Dublin.....	894	3,551
Edinburgh.....	1,819	3,635
Glasgow.....	4,031	8,091
	11,736	51,363

Thus in sixteen of the principal towns in the United Kingdom less than one-quarter of the messages are taken in at the post-offices. In London the telegraph office has only recently been located in the new post-office building.

The chief, if not the only advantage possessed by the Postal Telegraph over those owned by private companies, is that of being free from competition; but this monopoly of the business could be secured by the Government without attaching it to the post-office. In all other European countries the administration of the telegraphs constitutes a distinct department under the Ministries of the Interior, Public Works or Finance, and I think a similar course will ultimately be adopted in England.

AUSTRALIAN SAVAGES ATTACKING TELEGRAPH STATIONS.

A dispatch from Rockhampton, Feb. 6th, to the Australian Associated Press, states that telegrams from the Gilbert River telegraph station report that the station is beleaguered by blacks in great numbers, and the station is barricaded against an assault. The station, which is built of sawn timber shingles, is garrisoned by the telegraph master, his wife, and one assistant. One musket is the only firearm they possess, and it was impossible to hold out long. Two volunteers, in charge of Sergeant Griffin, were just leaving for the scene of action, and the police were begging everywhere for the loan of firearms without obtaining any of the right sort. Large crowds of blacks reported within ten miles of Georgetown.

A despatch from Adelaide states that the natives at Barrow's Creek, 1,207 miles in the interior on Feb. 22d, attacked the telegraph station, inhabited by seven men and a black boy, killed the station-master (Mr. Stapleton) and a lineman named Frank and wounded an operator and the boy. Several natives were seen to fall, and one there is no doubt was killed. The Government has taken steps to dispatch assistance to the telegraph station. Mr. Stapleton was an American, and was formerly employed on the Grand Trunk Railway of Canada as an operator.

SOUNDINGS FOR THE PACIFIC CABLE.

Dispatches to the Navy Department report that the United States steamer Tuscarora, Commander Belknap, engaged in taking deep-sea soundings, left Honolulu March 18, and arrived at Yokohama, Japan, April 27, having made 62 casts, the deepest of which was 3,287 fathoms. She will now examine the southeast coast of Japan, and from there carry a line of soundings to Touogá, Aleutian Islands, and from thence complete the arc of the great circle to the point reached last Fall from Puget Sound.

ANNUAL REPORT OF THE SWISS TELEGRAPHS FOR THE YEAR ENDING DECEMBER 31, 1873.

I.—Lines.	
Length of Lines, in miles—Government.....	3,631
“ “ “ Railroad.....	73
“ “ “ Private.....	40
	3,743
Length of Wires, in miles—Government.....	8,804
“ “ “ Railroad.....	1,015
“ “ “ Private.....	64
	9,883
II.—Offices.	
Government.....	715
Railroad or private companies.....	85
Consignment Offices.....	34
	119
Total.....	834
With permanent service.....	5
With full day service.....	53
With limited service.....	743
Total.....	800
Consignment Offices.....	34
	834

III.—Apparatuses.	
Morse.....	1,084
Hughes.....	23
Translating Relays.....	108
Total.....	1,209

IV.—Personnel.	
Upper Employés and Central Administration.....	19
Number of Office Employés.....	1,353
Subaltern Personnel.....	56
Total.....	1,327

V.—Messages.	
Interior Service—Messages sent.....	1,641,075
International Service—	
Number of Messages sent abroad.....	278,223
Number of Messages received from abroad.....	273,663
	2,191,961
Number of Messages passing in transit from one frontier to the other.....	230,048
Total General.....	2,422,009

VI.—Receipts.	
Product of Home Correspondence.....	\$169,093 00
Product of International Correspondence.....	95,248 46
Product of Transit Correspondence.....	38,900 00
Sundry Receipts.....	21,928 10
Total.....	\$325,208 56

VII.—Expenses.	
Maintenance of Line.....	\$51,300 76
Personnel.....	219,445 20
Office Expenses and Furniture.....	61,855 64
Total.....	\$332,601 60

General Information.	
Population of the State, according to census.....	2,609,095
Surface of the State in square miles.....	16,000

ON THE PERMANENT MAGNETISM OF STEEL.—*M. Bouly*.—Consider two bodies, A and B, submitted to the same inductive force, but invariably bound together. After cessation of the force, A remains subject to the action of B, and preserves, besides the residual magnetic moment which would remain with it after removal of A, a moment of the same or of contrary direction, produced by influence of B, and which is permanent only so long as the connexion between A and B subsists. This magnetic excess might be called the *sub-permanent magnetic moment*. In the experiment of a bundle ruptured parallel to the axis, the sub-permanent magnetism is of the contrary direction to the permanent magnetism. It would be in the same direction in the case of a cylindrical needle broken perpendicular to its axis, and the two fragments of which were separated or placed end by end. This is confirmed by experiment.

NEW RAILWAY SIGNAL.

MM. Lartique and Laforest have recently invented a novel device, intended as a danger signal, which the *Revue Industrielle* states is now in successful use on some of the French railroads. A whistle is arranged on the locomotive so that it will, when once opened, continue sounding until shut by the engineer. The same device which turns the disc signal, so as to show the danger side, is extended to transmit a current of electricity to a little projection between the rails. When the engine passes over this spot, a metallic brush hanging between its wheels strikes on the projection and sweeps over it, at the same time transmitting the current to an electro-magnet which pulls the whistle open. The latter, by continuously sounding, warns the engineer.

MAPS BY TELEGRAPH.

A member of the Parisian Academy of Science has devised a method whereby exact maps and diagrams may be transmitted by telegraph. A numerically-graduated semi-circular plate of glass is laid by the telegrapher over the map to be transmitted, and a pencil of mica, attached to a pivoted strip of metal, also divided into numbers, allowed to move over the plate. Looking through a fixed eye-piece, the operator traces out his map on the glass with the adjustable mica pencil, and, noticing the numbers successively touched on the plate and on the moving metal arm, telegraphs them to his correspondent, who, by means of an exactly similar apparatus, is thereby enabled to trace out an exactly similar map.

HOW THE ENGLISH GOVERNMENT TREATS ITS FEMALE OPERATORS.—A correspondent of the *English Mechanic*, who signs himself “a father of six girls,” writes to that journal giving not a very flattering account of the treatment the young ladies receive in the Government Telegraph Office in London. He says that the ventilation of the new building in St. Martin's-le-Grand is so bad that it is very difficult to work there in the evening. No place is provided for hats, cloaks, &c., and every one's knife, fork, plate, mug and slippers have to be carried backward and forward every day. He adds: “The girls seem to be made work as hard as possible, and if the slightest mistake is made they are mulcted in one, two or three hour's extra duty, without even a chance being given them of knowing whether they were fairly culpable or not. The company of the men and messenger boys is not only most disagreeable, but baneful to a young girl, for the conversation which is allowed to go on unchecked; while as to salary, all sorts of excuses are made to keep them as low as possible. *Ex post facto* laws are made which make the girls cry shame on the managers; for they are all intended to get more work out of them.”

WORTH OF MOMENTS.—Dr. Arnold of Rugby said, “There are moments that are worth more than years. We cannot help it; there is no proportion between spaces of time in importance, nor in value. A stray unthought-of five minutes may contain the event of a life. And this all-important moment, this moment disproportionate to all other moments, who can tell when it will be upon us!”

THE first known treatise on stenography is the curious and scarce little work, entitled “Arte of Shorte, Swifte, and Secrete Writing by Character, invented by Timothee Bright, Doctor of Physike.”

CORRESPONDENCE.

BIRMINGHAM, Ct., May 5, 1874.

To the Editor of the Journal of the Telegraph:

Will you grant us a brief space in your column devoted to correspondence? The intent of this article is not to call attention to a recital of our personal grievances, for we think our powers of endurance in the respect of which we propose to speak equal to the emergency. But it is rather to call attention to the general lack of courtesy that exists between operators in their intercourse over the wires. Were our own case the only one within our knowledge we might, perhaps, adopt the view that we had in some way deservedly incurred the special displeasure of some of our fellow operators, and, considering ours an isolated case, be content to let it pass without comment. But when (as is the case) we are cognizant of similar cases occurring every day, where other parties are the principal actors, we are impelled to the belief that the evil is more prevalent than would be at first supposed.

One case only we shall cite from many similar ones.

A few weeks since we sent a message to Philadelphia to which an answer was requested, payment therefor being deposited with us, and a notice to that effect accompanying our message. In due time the answer was received, but, owing either to a peculiar lack of descretion, or else a beautiful confidence in his friend's ability to pay for anything he chose to send, the recipient of the message in Philadelphia chose to send a reply, containing forty-five words—the tariff upon which would be \$1.55. In addition to this, he chose to send it from one of the numerous branch offices in which that city abounds, and from which to the main office there is an additional tariff of one cent per word—making the check accompanying it read, “45; collect, 1.55 and .45. Very naturally, our man was somewhat surprised, and emphatically demurred, when we exacted of him \$1.50 in addition to the 50 cents he had previously paid us, until, comprehending that such a disbursement was a very necessary step towards gaining possession of the desired message he reluctantly complied.

We explained, to the best of our ability, how the extra 45 cents had accrued, but he declared that his friend lived near the main office, and that the idea of an extra 45 cents was an imposition. He refused to be comforted, and we finally suggested that we send an office message to Philadelphia and ascertain, if possible, the particular branch office from which the message was sent. He admitted that such a course would afford some satisfaction. So we accordingly made out a message to that effect, and commenced to transmit it. We had progressed far enough to reveal its purport, when our brother operator, at repeating office, broke, and remarked, “What a fool.” Being naturally of an inquiring disposition we were unwilling to be content with such an extraordinary O. K., and before we had finished sending, too, we mildly requested an explanation. Our brother vouchsafed no reply save a repetition of his former complimentary expression. We then proceeded to finish sending it, and no O. K. being given, we called the office for ten minutes, but elicited no response. The inference to be drawn from this was, that our brother considered it an unnecessary, illegitimate message, and without asking any explanation of the circumstances which attended it, arrogated to himself the right to refuse it with silent contempt, after relieving himself of the fit of playfulness mentioned. The following day our customer called, according

to agreement, and upon learning that no reply had been received, was more than ever of the opinion that we had defrauded him of 45 cents.

In vain we showed him the copy taken from the instrument, and explained that we were bound to collect it as received, or lose it ourselves. He doubtless argued, “I see the copy in your handwriting, and see that it says as you say, but I am absolutely compelled to take your word for it. It would be just as easy for you to write collect ten dollars, or any preposterous sum, and I could not tell the difference.”

We have no register in this office, so that no record of work is left except copies. And if we had, and the proof should remain on the paper as it came from the register, our friend being of that nationality, a prominent characteristic of which is an utter unwillingness to be convinced of anything, no matter how powerful the arguments advanced in its favor, would probably have been just as skeptical as before unless he could have read it himself.

The consequence was that our customer left in high dudgeon, denouncing the Western Union and its agents as a band of robbers conspiring to defraud the poor man of his hard earned savings.

And this, when a simple act of courtesy on the part of one operator to another would probably have produced the desired message, vindicated our honor, and, partially at least, satisfied our customer that the responsibility lay with his friend. Strictly speaking, we had no right to expect an answer to such a message, except through courtesy. But is not every repeating office bound to take any message that is sent them, and leave the office to which it is going to decide upon its legitimacy or illegitimacy? Is there any rule or regulation governing the operators of the Western Union Telegraph Company, under which they can claim exemption from observing the same rules of etiquette and common courtesy in their intercourse with operators on the wires which govern them in society?

If there be, we have yet to be made aware of its existence. J.

NEW YORK, April 27, 1874.

To the Editor of the Journal of the Telegraph:

Please state through the JOURNAL, for the benefit of the many receivers and operators who have no regular system of counting, the official rule for counting such words as St. Paul, New York Central, Rock Island and North-Western, when applied as names of stocks? RULE.

Answer.—Rule 9 says:

“Names of persons and places when given to things must be counted according to the number of distinct words in each.”

Under this, St. Paul, Rock Island and North-Western would be two words each, and New York Central three.

April 23, 1874.

To the Editor of the Journal of the Telegraph:

A man left a half-rate message with me to-day, saying, “Send it collect.” I told him, “Can’t do it—the rules require prepayment.” He said, “I never heard of any such rule, and have sent half-rate messages every day from ——— office, and have paid for none in cash.” I told him he was certainly mistaken. He replied, “I am not mistaken; I have an account there—perhaps they have been charged to me. I have never been asked to pay cash.”

This is hardly just to those who enforce the rules and get anything but thanks from the public for so doing.” A.

TUSKALOOSA, Ala., May 1st, 1874.

To the Editor of the Journal of the Telegraph:

Will it affect the working of a main battery of 40 cups to have the cups sitting on a platform made of line wire, the wires being about an inch apart?

TUSKALOOSA, ALA.

Answer.—It will unless the outside of every cup is perfectly dry, a condition almost impossible to attain. Any moisture upon the outside of the cells conducts electricity to the metallic shelves, and, to a certain extent, short circuits the battery.

MARYVILLE, Md., April 21, 1874.

To the Editor of the Journal of the Telegraph:

How many words in the following message?

“W. H. JACKSON or E. D. BIRD: Send the money by first express. Will send receipt by mail on arrival.”

Please answer in JOURNAL. What I want to know is, if that second address should be counted?

Answer.—The four extra words in the address should be charged for—seventeen words in all.

GOLDSBORO, N. C., April 27, 1874.

To the Editor of the Journal of the Telegraph:

Has a repeating office a right to deliver messages destined for other offices, if parties messages are addressed to apply at repeating station for copy? For instance, New Berne, N. C., sends message to party in Tarboro, N. C.; party is expecting this message and leaves before received. Have we a right to deliver without it is repeated from office of destination. This information is asked in cases where parties are known or identified. W.

Answer.—The message should not be delivered by the repeating office in the manner described. It should be forwarded from the office of destination.

HARRISBURG, May 5, 1874.

To the Editor of the Journal of the Telegraph:

A man came to my office and said: “Ask Pittston if there is a message there for me, and tell him to forward it here.” I cannot work direct with Pittston, and would have to send a message to find out. Should I send the message free or make the man pay for it? He said other offices do it for him. I have been asked that quite frequently, and would like to know for future use. Please answer through JOURNAL. S. E. G.

Answer.—Such messages should not be sent free. Both the message to the Manager at Pittston or (any other place), and his reply, if he sends one, should be charged for at the regular rates. It would make no difference whether you worked direct with the station or not.

To the Editor of the Journal of the Telegraph:

I receive a message addressed thus: “To M—H—; works in saw-mill.” Is such an address proper or sufficient, going to a place where there are twenty saw-mills? Such an indefinite address is very annoying when one is operator and messenger. Have I a right to require better address? INQUIRER.

Answer.—Such an address is insufficient under the circumstances given, but it would be well to make every possible effort to deliver the message before sending for better address. Your annoyance is not unreasonable, but the shortcoming of the clerk who received the message should not be allowed to operate to the injury of the customer.

RIVER PLATE AND BRAZIL TELEGRAPH.

The River Plate and Brazil Telegraph Company was formed to complete the chain of communication between Europe and South America, by connecting, by a submarine cable, the City of Rio de Janeiro with the Cities of Montevideo and Buenos Ayres. The cables are now being laid by the steamers Ambassador and Gomos. The Company also owns the land lines erected under the concession granted by the Montevideo Government for that Republic, and, further, it leases the system of the Montevideo and Brazilian Telegraph Company, which extends from Montevideo to the Brazilian frontier. In its turn, the present Company has leased its own system to the Western and Brazilian Telegraph Company, whose lines extend from Para to Rio. The latter Company undertakes to work the whole system, and to hand over to the leased Company 20 per cent. of the gross receipts of the whole conjoined system. Of this 20 per cent., 3 per cent. is to be paid to the Montevideo and Brazilian Company, and the remaining 17 per cent. belongs to the River Plate Company. The share capital over which the debentures now offered take precedence is £400,000. The system of which the River Plate lines form a part will, on completion, form a valuable addition to existing lines of communication, and will especially be the means of increasing the business of the Eastern system from Lisbon.

HOOPER'S TELEGRAPH WORKS.

A meeting was held on the 15th of April on board the cable steamship Hooper, in Millwall Docks, prior to the departure of that vessel on her third voyage to the Brazils, for the purpose of laying the section of cable between Para and West Indies, and, in connection with the West India and Panama Telegraph Company's system, to connect the Empire of Brazil with the United States. Mr. Dunlop, Chairman of Hooper's Telegraph Works, presided on the occasion, and in proposing continued success to the Hooper on her present voyage, referred to the very satisfactory condition of the cables already laid for the Western and Brazilian Telegraph Company—a statement confirmed by Mr. Heugh, Chairman of the Company. Mr. Earl, Managing Director of the West India and Panama Company, referred to arrangements in course of completion between his Company and the Company for whom the cable now on board the Hooper has been made, and, although previously associated with rival companies, he was to be afforded the opportunity of testifying to the skill displayed in the present arrangements for the manufacture and laying of the cable by Hooper's Company. Mr. Weaver and Mr. Andrews, other Directors of the West India and Panama Company; Mr. Orton, President of the Western Union Telegraph Company of New York; Mr. Chaytor, Director of the Brazilian Submarine Telegraph Company; Mr. Erichsen, representing the Great Northern Telegraph Company; Mr. Medsen, under whose inspection the cables for the Great Northern Telegraph Company were manufactured; Major Bateman Champain, Major Stiffe, Mr. Preece, of the Telegraph Department of the Post-Office, Sir Samuel Canning, Mr. H. C. Forde, Mr. C. Seymour Grenfell, Mr. Bramley Moore, M. Bessemer, Captain Pender, Captain Hull, Mr. Blakeney, and Mr. Snelling of the Hydrographic Department of the Admiralty, were also present. Major Bateman Champain, in reply to the toast proposing his health, had much pleasure in saying how excellently the cables supplied by Mr. Hooper, and submerged in the Persian Gulf and between Ceylon and India in 1865 and 1868,

still continue to act. The healths of Mr. Dunlop and Mr. Hooper (the Managing Director) were severally proposed and responded to.

WESTERN AND BRAZILIAN TELEGRAPH.

A circular has been issued by this Company which states: "The Central American Company was formed to make the connection between the northern limit of this Company's cables and the West Indies, and thence by existing lines to New York. This Company has acquired, by disposal of surplus cable to the Central American Company, nearly one-half of the capital of the Central American Company. The arrangements are completed, and the cable of the Central American Company to connect Demerara and Pará is being shipped in the steamship Hooper. The interests of this Company and the Central American Company being thus so closely allied, it becomes of extreme importance that the connecting lines of the Central Company should be laid without delay, thereby developing a traffic which the trade between North and South America will certainly bring to the cables of the Western and Brazilian Telegraph Company. The Central American cables are nearly all made, and are all paid for, so far as cash payments are concerned, within a sum which £100,000 will cover.

THE INDO-EUROPEAN TELEGRAPH COMPANY announce that in consequence of urgent representations made to the Indian Telegraph Department the notice recently issued with respect to charging for compound words has been modified. The Indian Department will now accept as single words all ordinary English words, proper names of persons and places, which are commonly written and recognized as one word. When any *bona fide* doubt exists as to the proper mode of spelling an ordinary English word, the sender's manner of writing is to regulate the charge. All illegal combinations of words will be charged for according to the number of words employed in the combination; illegitimate combinations of syllables with words will be treated as cyphers, five letters being counted as one word.

ADVICES from Panama, of April 23d, state that the Cuba Telegraph Cable is now in good working order. A message from Liverpool, dated April 17th, was received at Panama on the 19th.

THE steamer with the section of the South American cable to be laid from Para, Brazil, to Demerara, sailed from Gravesend May 3d.

THE traffic receipts of the Eastern Telegraph Company for the month of March last amounted to £81,899, and for March, 1873, to £33,572, showing a decrease of £1,673.

THE NEW WESTERN UNION OFFICE IN BALTIMORE.

The Western Union Telegraph Company has removed its main office from the location which it has so long occupied on the southwest corner of South and Baltimore streets, in Baltimore. Offices have been elegantly fitted up by the Company in the new building of Alexander Brown & Sons, on the southwest corner of Baltimore and Calvert streets. The whole of the spacious new building, with the exception of the first floor, which will be occupied by Brown & Sons as a banking house, has been leased to the Telegraph Company.

The old office, which has been occupied by the American and Western Union Companies for sixteen years, was vacated at two o'clock in the morning of Saturday last, May 2.

THE MECHANICAL EQUIVALENT OF HEAT.

Independently of what had been done by others, and working in his own line, Dr. Joule had established relations, as we have seen, between heat and chemical affinity in 1840, and, some two years later, he applied the dynamical theory to steam-engines, to electro-magnetic engines, to vital processes, and to chemistry. "His paper on the 'Electric Origin of Heat' was a first communication, in 1842, to the meeting of the British Association at Manchester—the last meeting, by-the-way, at which Dalton appeared; and on August 21, 1843, a circumstance which requires special mention, he communicated a second paper to the Association, then meeting at Cork, in which he describes a series of experiments on magneto-electricity, executed with a view to determine the mechanical value of heat. Experiments, with a like object, on the condensation of air, were communicated to the Association in 1844; and in 1845 his important paper, 'On the Mechanical Equivalent of Heat,' detailed the results he had gained from water agitated by a paddle-wheel. In following years, the same subject was perseveringly prosecuted, by numerous and yet more accurate experiments, until his grand determination was finally reached. In an elaborate paper, read before the Royal Society, January 21, 1849, and published in 'Philosophical Transactions' of 1850, we have the results thus stated: 1. 'The quantity of heat produced by the friction of bodies, whether solid or liquid, is always proportional to the quantity of force expended;' 2. 'The quantity of heat capable of increasing the temperature of a pound of water by 1° Fahr., requires for its evolution the expenditure of a mechanical force required by the fall of 772 pounds through the space of one foot.'

Dr. Tyndall gives the following explanation of the term "foot-pounds," used as a measure by Joule: "The quantity of heat which would raise one pound of water one degree in temperature is exactly equal to what would be generated if a pound-weight, after having fallen 772 feet, had its moving force destroyed by collision with the earth. Conversely, the amount of heat necessary to raise a pound of water one degree would, if applied mechanically, be competent to raise a pound-weight 772 feet high, or it would raise 772 pounds one foot high. The term 'foot-pound' expresses the lifting of one pound to the height of a foot. Thus the heat required to raise the temperature of one pound of water one degree being taken as a standard, 772 foot-pounds constitute what is called the *mechanical equivalent of heat*."—From *Sketch of Dr. JOULE, in Popular Science Monthly for May*.

WHO DUG THE POST HOLES?

They have a young Irishmen's debating society in Geneva, New York. The subject up for discussion at their last meeting was, "Which is of the most benefit to the country—the mechanic or the laborer?" One young man took the side of the mechanic and expatiated at great length. Among a multitude of others he claimed this, that the mechanics made and laid the Atlantic cable, and sat down amid loud applause. For a few minutes it looked as if there were none bold enough to try to contradict his statements. At length a laborer came forward and said that he had a few words to say on the subject. He said he was willing to admit that the mechanic made and laid the Atlantic cable; but, exclaimed he, smiting the table with a fist about the size of a twenty-three pound ham, and looking around with an air of triumph upon the audience, who were terrified at seeing the table sink to the floor under the force of his ponderous blow, "be jabers, *who dug the post holes?*"

TARIFF BUREAU.

SEMI-MONTHLY CIRCULAR.

EXECUTIVE OFFICE,
WESTERN UNION TELEGRAPH COMPANY,
145 BROADWAY, NEW YORK,
May 15, 1874.

To all Offices on W. U. Lines:

The following changes and additions have been made since the date of the last circular:

GENERAL INFORMATION.

Maplesville, Ala., closed.
Manitou House, Colorado Springs, Col., reopened, check direct.

Hereafter the "tariff for other lines," from Sioux City, Iowa, to Elk Point and others in Dacotah, will be as follows:

Elk Point, Dac., 25 2 Vermillion, Dac. 30 2
Fort Randall, " 150 10 Yankton, " 40 3

Cave Spring, Ga., closed.
Waynesboro, Ga., closed.
Calumet, Ill., changed to Kensington.
Bluff Hall, Ill., reopened, square 878.
Hereafter business for Grandview, Newburg, Rockport and Tell City, Ind., will be sent via Evansville, Ind., only.

Brandenburg, Ky., closed.
Cloverport, " "
Lewisport, " "
Rock Haven, " "
Stephensport, " "

Hereafter business for Hawesville, Owensboro and Uniontown, Ky., will be sent via Evansville, Ind., only.

No. Bridgewater, Mass., changed to Brockton.
Business for Montague, Mass., will hereafter be checked direct.
Leroy, Mich., office on other lines printed in Tariff Book, is in Osceola Co.

Au Gres Lumber Boom, Mich., reopened, square 148.
Rifle Lumber Boom, Mich., reopened, square 148.
The following is a revised list of offices in Michigan on the D. L. & L. M. R. R. line, with "tariff for other lines."

	Detroit, Mich.	Lansing, Mich.	Ionia, Mich.
Brighton	40.3	40.3	..
Coral (New Office)	..	..	40.3
Chadwick's "	..	..	30.2
Eagle "	..	30.2	30.2
Fisher's "	30.2	50.4	..
Gowen "	..	..	40.3
Fowlerville	50.4	30.2	..
Grand Ledge	..	30.2	30.2
Greenville	..	..	30.2
Howell	50.4	40.3	..
Leroy, Ingham Co. (New Office)	50.4	30.2	..
Lyons, (New Office)	..	40.3	30.2
Maple Valley (New Office)	..	..	40.3
Okemos	60.5	30.2	..
Portland	..	40.3	30.2
So. Lyon (New Office)	40.3	50.4	..
Trufant's (New Office)	..	..	40.3
Williamston	50.3	30.2	..
Fort McPherson, Neb., closed.	..	..	..
Point-du-Chene, N. B., reopened.	..	..	..
Chatham, N. J., reopened.	..	..	..

The tariff on messages to Bergen, Lafayette and Hudson City, N. J., will hereafter be 15 cents more than the rate to Jersey City Coal Point, N. Y., is now a W. U. office, square 83; check direct.

The P. O. A. of Dobbs Ferry, N. Y. is, Greenburgh.
Hillsboro, N. C., closed.
The P. O. A. of So. Lebanon, O., is Deerfield.
Indian Creek, Pa., closed.
Greenwood, S. C., reopened; tariff for other lines as per Tariff Book.

Gardiner, Tenn., closed.
The P. O. A. of Lafayette, Tenn., is Rossville.
Sheldon, Vt., is now an other line office; tariff 40 and 3 from St. Johnsbury, or 25 and 2 from Swanton, Vt.
Camp Stambaugh, Wy., closed.

NEW OFFICES.

334 Chunchula, Ala.
591 Las Animas, Col.
* Greenwood, Dac., 100 7 463 Sioux City, Iowa.
* Yankton Agency, " 100 7 463 " "
307 Kensington, Ill. (formerly Calumet).
271 Moran, Ind.
299 Sand Creek, Ind.
367 Calamus, Iowa.
283 Oakland, Ky.
385 Terrebonne, La.

18 Brockton, Mass. (formerly No. Bridgewater).
* Humboldt, Mich., 150 10 307 Chicago, Ill.
* Michigamme, " 150 10 " "
* Republic, " 150 10 " "
* Castle Rock, Minn., 100 7 " "
* Cokato, " 125 8 " "
* Stockton, " 75 5 " "

473 Scribner, Neb.
41 Hastings, N. Y.
41 Tompkinsville, S. L., N. Y.
180 Pauls, O.

2 Brookfield, N. S.
2 Hopewell, "
* Gibsonburg, O., 55 4 191 Mansfield.
* Longdale, Va., 40 3 96 Richmond.

38 Congress Hall, Sheldon, Vt.
35 No. Williston, Vt.

30 Orwell, "
31 Royalton, "
30 Shoreham, "
39 Whiting, "

* Alaska, Wis., 75 5 307 Chicago, Ill.
* Blair, " 100 7 " "
* Centerville, " 50 3 " "
* Hixton, " 100 7 " "
* Junction City, " 75 5 " "
* Kendall, " 75 5 " "
* Knapp, " 100 7 " "
* Lafayette, " 75 5 " "
* Lima, " 40 3 " "
* Lowery, " 75 5 " "
* Marshland, " 75 5 " "
* Midway, " 75 5 " "
* Remington, " 60 4 " "
* Richmond, " 35 2 " "
* Unity, " 75 5 " "
* Wis. Valley Junc., " 75 5 " "

The following is a revised list of the offices and tariffs of the Grand Rapids and Indiana R. R. line:

	Richmond, Ind.	Ellettsville, Ind.	Wayne, Ind.	Kalamazoo, Mich.	Grand Rapids, Mich.	Ionia, Mich.
Bradley, Mich.	25	25	..
Cedar Springs, Mich.	50	..
Clam Lake	35	40
Howard, Montcalm Co., Mich.	80	..
Kingsley	50	..
Leroy, Osceola Co.,
Mendon	40	25	..	..
Monteith	25	25	..
Manton	60	..
Mayfield	60	..
Morley	35	..
Martin	25	35	..
Pearson	25	..
Paris	40	..
Rockford	25	..
Sand Lake	25	..
Stanwood	35	..
Traverse City	60	..
Walton	60	..
Wayland	25	25	..
Decatur, Ind.	40	25	..	..	..	..
Geneva, " (Reopened)	40	35	..	..	..	..
Huntertown, Ind.	..	25	50	..	..	..
La Grange	..	35	35	..	..	..
Lynn	25	50	..	..	..	..
Portland	35	35	..	..	..	..
Swan's	..	25	50	..	..	..

The rate for additional words is the same as that on W. U. lines.

ATLANTIC CABLE BUSINESS.

We are notified that messages for Spain may now be forwarded by the new cable between Marseilles and Barcelona. Tariff \$3.63 for twenty words or less, and half-rate for each additional ten or fraction of ten words.

On messages for transmission by this route the words *via Marseilles* should be inserted and charged for.

The cable formerly between England and Bilbao, Spain, now connects England with Santander. In messages for Spain via this cable, the words *via Santander* should be inserted. Charges same as *via Bilbao*.

TO OFFICES HAVING "SHEET C."

Add the following offices to your "Sheet C.":

7 Centerville, Wis.
38 La Crosse, Wis.

WILLIAM ORTON, President.

MR. PAUL W. BOSSART, formerly Superintendent of Telegraph of the Buffalo, New York & Philadelphia road, has been appointed Superintendent of Telegraph of the Great Southern Railroad, and is now engaged in building the Company's telegraph line, from Jesup, Ga., to Jacksonville, Fla.

THE TELEGRAPHERS' MUTUAL BENEFIT ASSOCIATION.

ACKNOWLEDGEMENT OF RECEIPTS FOR ASSESSMENTS NOS. 55, 56 AND 57 UP TO AND INCLUDING MAY 12, 1874.

21, 617, 667, 698, 787, 920, 1064, 1098, 1240, 1461, 1462, 1678, 1805, 1818, 1827, 1876, 1917, 1953, 1954, 1962, 1966, 1887, 2005, 2109, 2126, 2161, 2191.

ACKNOWLEDGMENT OF RECEIPTS FOR ASSESSMENTS NOS. 58, 59 AND 60 UP TO AND INCLUDING MAY 12, 1873.

8, 21, 31, 42, 78, 82, 84, 90, 126, 139, 143, 154, 156, 158, 160, 164, 185, 198, 197, 208, 252, 255, 280, 316, 323, 325, 341, 346, 350, 352, 357, 362, 364, 366, 371, 376, 379, 381, 382, 412, 414, 418, 481, 482, 527, 552, 556, 557, 565, 569, 574, 586, 597, 605, 617, 655, 687, 690, 695, 697, 698, 705, 710, 712, 717, 723, 724, 726, 728, 730, 733, 780, 781, 782, 783, 785, 786, 787, 791, 802, 823, 825, 836, 839, 841, 842, 869, 870, 874, 876, 880, 897, 904, 906, 908, 920, 926, 942, 944, 963, 954, 956, 957, 959, 960, 963, 964, 977, 979, 1014, 1016, 1030, 1081, 1083, 1084, 1041, 1046, 1050, 1057, 1063, 1071, 1072, 1084, 1085, 1098, 1099, 1108, 1105, 1106, 1107, 1108, 1109, 1110, 1112, 1113, 1115, 1117, 1119, 1120, 1121, 1122, 1123, 1125, 1131, 1139, 1141, 1164, 1190, 1198, 1194, 1206, 1211, 1221, 1226, 1237, 1284, 1285, 1287, 1288, 1248, 1256, 1267, 1268, 1270, 1281, 1283, 1284, 1285, 1286, 1292, 1295, 1336, 1400, 1405, 1406, 1426, 1428, 1430, 1432, 1433, 1461, 1462, 1465, 1469, 1471, 1474, 1475, 1476, 1488, 1490, 1498, 1502, 1504, 1505, 1528, 1529, 1530, 1532, 1556, 1557, 1558, 1559, 1570, 1572, 1579, 1597, 1610, 1611, 1612, 1613, 1616, 1619, 1649, 1656, 1660, 1661, 1662, 1663, 1665, 1667, 1670, 1673, 1676, 1678, 1681, 1682, 1684, 1687, 1688, 1696, 1697, 1698, 1700, 1701, 1702, 1704, 1708, 1709, 1710, 1713, 1723, 1724, 1726, 1727, 1728, 1741, 1746, 1747, 1750, 1751, 1753, 1754, 1755, 1756, 1757, 1758, 1759, 1760, 1765, 1766, 1767, 1768, 1769, 1771, 1773, 1775, 1789, 1807, 1813, 1827, 1828, 1830, 1837, 1838, 1839, 1840, 1841, 1844, 1845, 1857, 1858, 1859, 1860, 1876, 1888, 1889, 1895, 1896, 1897, 1916, 1917, 1931, 1938, 1942, 1945, 1953, 1954, 1962, 1964, 1966, 1969, 1972, 1973, 1985, 1988, 1987, 1992, 1993, 2005, 2007, 2010, 2012, 2016, 2023, 2041, 2045, 2053, 2056, 2061, 2072, 2079, 2085, 2092, 2095, 2098, 2103, 2109, 2110, 2126, 2130, 2131, 2145, 2151, 2153, 2156, 2157, 2159, 2160, 2166, 2167, 2168, 2171, 2180, 2183, 2184, 2185, 2187, 2191, 2193, 2194.

ACKNOWLEDGMENT OF RECEIPTS FOR ASSESSMENT NO. 61, UP TO AND INCLUDING MAY 12.

8, 21, 25, 46, 58, 59, 61, 77, 82, 90, 91, 93, 95, 121, 122, 134, 136, 139, 141, 142, 143, 144, 145, 153, 157, 181, 217, 220, 223, 235, 244, 245, 254, 255, 257, 269, 276, 302, 323, 325, 344, 346, 349, 351, 360, 361, 371, 376, 379, 381, 394, 406, 414, 416, 425, 430, 431, 463, 464, 467, 526, 532, 546, 547, 548, 549, 565, 578, 577, 579, 584, 600, 603, 604, 605, 615, 617, 618, 622, 667, 670, 690, 696, 715, 729, 731, 740, 742, 750, 751, 756, 769, 787, 791, 799, 803, 821, 830, 831, 832, 855, 859, 871, 873, 874, 886, 915, 923, 941, 973, 995, 1013, 1023, 1034, 1039, 1040, 1047, 1054, 1055, 1072, 1081, 1084, 1085, 1099, 1126, 1143, 1144, 1147, 1154, 1167, 1169, 1173, 1175, 1183, 1193, 1194, 1195, 1200, 1210, 1218, 1224, 1236, 1252, 1245, 1251, 1252, 1259, 1260, 1267, 1274, 1276, 1282, 1304, 1325, 1329, 1336, 1359, 1364, 1365, 1368, 1394, 1402, 1403, 1404, 1410, 1412, 1421, 1440, 1444, 1461, 1462, 1464, 1468, 1502, 1511, 1517, 1518, 1519, 1522, 1527, 1537, 1550, 1560, 1571, 1576, 1579, 1582, 1583, 1594, 1596, 1615, 1619, 1626, 1633, 1673, 1695, 1697, 1698, 1707, 1708, 1720, 1721, 1723, 1728, 1729, 1735, 1736, 1738, 1791, 1809, 1811, 1812, 1817, 1827, 1831, 1847, 1853, 1864, 1869, 1874, 1911, 1913, 1914, 1919, 1938, 1945, 1944, 1950, 1953, 1954, 1962, 1966, 1969, 1973, 1987, 2006, 2017, 2019, 2020, 2022, 2024, 2025, 2026, 2027, 2028, 2031, 2035, 2036, 2040, 2049, 2050, 2056, 2057, 2059, 2062, 2066, 2067, 2092, 2102, 2106, 2113, 2128, 2119, 2133, 2135, 2143, 2168, 2172, 2186, 2187, 2191, 2194.

MISCELLANEOUS.

58.—916, 920, 1269, 1488, 1907, 1915.

BORN.

BAILEY.—At Santa Cruz, Cal., February 24, 1874, to J. R. Bailey, Manager W. U. Telegraph office, formerly of L'Anse, Mich., a son.

BOUNDS.—At Woodland, Cal., May 2, 1874, to M. B. Bounds, Manager W. U. Telegraph office, a son.

BYNUM.—At Horn Lake, Miss., May 2, 1874, to B. S. Bynum, Manager W. U. Telegraph office, a daughter.

MARRIED.

CUNNINGHAM.—CARPENTER.—At Omaha, Neb., April 29, 1874, by Rev. Garrett Court, M. Cunningham of New York to Miss Katie Z. Carpenter of Omaha.

JENES.—PIERPOINT.—At Calvary Presbyterian Church, Parkersburg, W. Va., Thursday evening, April 16, 1874, by Rev. W. H. McGiffert, Orrin Jenks, Jr., of W. U. Telegraph Company, to Miss Ella M. Pierpoint, all of Parkersburg.

DIED.

HAYGOOD.—At Fort Gaines, Clay County, Ga., April 25, 1874, of typhoid pneumonia, Julia, daughter of A. Watts Haygood, Manager W. U. Telegraph office, aged 4 years, 7 months and 5 days.

SCULLY.—At Brooklyn, L. I., Thursday, April 30, 1874, after a lingering illness, Bertha M., daughter of Thomas P. Scully, of the Gold and Stock Telegraph Company, New York.

TELEGRAPHING THE BUDGET.

In the days of the old Telegraph Companies the Budget night was the great event of the year, so far as the transmission of news for the press was concerned. It was the one occasion on which refreshments were allowed to the telegraph clerks. At that time the Budget, telegraphically speaking, consisted of about two or two and a half columns at the outside, sent to some 12 or 15 of the leading provincial newspapers, and a short summary, chiefly figures, to the less important newspapers. The collection of news for the press was all in one hand at that time, and competing News Associations, of which several now exist, were practically unknown. Telegraphic facilities were limited, too; the charge for transmission was high, and the system of direct communication with distant towns, so much in vogue in these days, was almost unattempted. Rarely was news transmitted a greater distance than from London to Edinburgh, and more often than not a break had to be made at York, especially in bad weather. If we put the quantity of news actually transmitted over the wires on a Budget night in those days at 100,000 words, or 50 columns of *The Times*, we shall probably be somewhat above the actual figures. Of course, in comparing this with the feat accomplished in the Central Telegraph Station on Thursday night, due allowance must be made for the greatly extended facilities, the better construction of the lines, and the greater experience of the telegraph clerks in dealing with news work. At the same time, one only realizes with difficulty the fact that on Thursday night no fewer than half a million of words, or 250 columns of this journal, were transmitted over the wires from the Central Telegraph Station between 6 P. M. and 2 A. M. Seeing, too, that a large quantity of this news had to be delivered to two or more newspapers in the same town, it is estimated that certainly not fewer than a million of words were so delivered throughout the United Kingdom during the period in question; so that the combined provincial newspapers of yesterday morning may be said to have contained 500 columns of telegraphed matter relating to the proceedings in Parliament on Thursday night. The transmission of this mass of news was effected chiefly by the Wheatstone instrument, of which as many as 25 were called into use on the occasion. This instrument doubles, and in some cases even triples, the carrying capacity of a wire; so that if a proportionate number of comparatively unskilled operators be employed in preparing the messages beforehand, they can be worked through the telegraphic threshing machine called the "Wheatstone Transmitter" at a speed varying from 120 to 60 words a minute. The preparation consists in punching holes on a strip of paper to represent the dot, the dash, and the space of the Morse alphabet; and this crotchet-like tape represents at the sending end of the wire what the ink marks do at the distant end. It is estimated that ten miles of perforated tape were consumed in the operations of Thursday night; that seven and a-half millions of separate holes, or perforations, had to be made; and five and a-half millions of distinct symbols recorded all over the country in transmitting the half million of words already referred to.

From the House of Commons were worked six of the fastest recording instruments in use by the Post-Office, and seated before them at the Central Station were an equal number of the most experienced operators of the staff. Some nimbly passed along the printed slip as it was unwound from the instrument with the one hand and wrote down its contents with the other, while others ignored the record alto-

gether, and translated the clicking sounds of the armature into the living words of the Chancellor of the Exchequer. But not all, nor, perhaps, even the greater portion, of the Parliamentary news of Thursday was received at the Central Station on these instruments. Large batches streamed in all the evening from the offices of the News Association and the different newspapers; and at 8 o'clock the pressure was at its height. The southwest gallery in the new Post-Office was crowded with instruments devoted solely to the transmission of news, and a hundred pairs of hands or more were busily employed either in preparing the perforated slip or in regulating its motion through the transmitter. Here on the first table as we enter is the "Express" wire, serving Birmingham, Manchester, and Liverpool simultaneously, and so called because it is capable of being worked at the highest speed. Adjoining it is the wire serving Nottingham, Sheffield, Leeds, and Bradford; while as many as six stations—viz., Bristol, Gloucester, Newport, Cardiff, Exeter, and Plymouth—are served by a third wire situated close by. These wires are usually worked in duplicate during the Parliamentary season, but on Thursday night they had to be worked in triplicate, and could hardly then keep pace with the requirements. Two wires sufficed for the combined wants of Edinburgh and Aberdeen, and two others were full all the evening to Glasgow and Dundee. Barrow-in-Furness, Hull, and Huddersfield each rejoiced in a wire of its own; while to Ireland as many as eleven wires were worked at the same time—viz., five to Dublin, four to Belfast, and two to Cork. While these may be regarded as the wires set apart specially for the news service, there were, of course, a large number of towns to which the Budget was supplied over the wires usually devoted to the general business of the department. Among these may be reckoned Brighton, Norwich, Ipswich, Derby, Leicester and Cambridge. The special wires were exclusively worked on the Wheatstone principle, and for this service as many as 25 perforating machines were brought into use. Some of these were worked by hand only, and chattered away briskly as they received a succession of blows from the right or left hand of the small boys in attendance. Others had the pneumatic system applied to them; and although only played upon with a piano-like touch by the operator, they produced three separate slips or taps with as great ease as the others produced one. The crochet-looking tape pervaded every corner of the gallery, and was apt to wind itself fantastically round your legs if you stepped out of the beaten track for a moment to investigate more closely the somewhat striking scene. The Birmingham instrument devoured yard after yard in the most remorseless fashion, but not an inch did it actually destroy. What had served for the Northern towns but a minute before was quickly transferred to the Western instrument alongside; and, perchance, the self-same slip might afterwards do duty on an Irish or a Scotch circuit. This is one of the numerous advantages of the Wheatstone system—that a slip once punched out may be put through almost any number of transmitters, provided it is not broken or damaged in any way. Nothing short of a system of this kind could have enabled the Post-Office to grapple successfully with the influx of business on Thursday last. An immense amount of work had to be performed in a very short time, and the pressure could only be kept down by working the wires at their utmost speed. The House adjourned at 12:35 A. M., and by 1 o'clock the whole of the news had been disposed of except to Ireland—where, of course the working is

much slower owing to the cable—and to one or two unimportant places in England. The staff of the Central Telegraph Station after 8 P. M. on Thursday consisted of 260 persons, and of these, 150 were specially employed in connexion with the transmission of news. Prior to 8 o'clock as many, probably, as 500 persons were on duty, the bulk of whom were young ladies. At 8 o'clock the young ladies entirely disappeared, and their places were taken by the male clerks, of whom the night staff is wholly composed. The change was effected without any perceptible influence on the work, and the busy scene, which continued up till midnight, was one which could hardly be witnessed without pleasure as well as profit.—*London Times*, April 18, 1874.

OBITUARY.

MÖRITZ HERMANN VON JACOBI.

Advices have reached us of the death, on March 10th, at St. Petersburg, Russia, of this eminent scientist. He was born at Potsdam, Prussia; but his life was mainly spent in Russia, where his many important discoveries in the application of galvanoelectricity to industrial purposes were made. He constructed a short line of telegraph in St. Petersburg in 1830, and ten years afterward his book, entitled *Die Galvanoplastik*, was published. He was for a long time associated with Klein in the investigation of the electro-deposition of iron, already described in these columns; and he suggested to the Czar Nicholas the formation of a regiment of galvanic engineers, to be trained in the management of electricity. This idea was carried out, and the learned doctor was made colonel of the galvanic regiment.

He constructed in 1834 the first electro-magnetic engine that was anything more than a model, and in 1838 he used it to propel a boat, containing ten or twelve persons, on the Neva. She was fitted with paddle wheels, and a speed of four miles an hour was maintained for several days. The power was supplied by a battery on the Grove principle, of 64 platinum plates, each having 36 square inches of surface.

His labors were highly appreciated in Russia, and were rewarded by many marks of imperial favor as well as by wide popularity.

ACCORDING to the *News*, the amount of entertainment that can be extracted from a telegraph pole by an average Baltimore audience is perfectly marvelous. A fair illustration of this has been given for several days past on Baltimore street. The digging of the hole elicited intense interest from an immense crowd, who manifested the same eager attention at every hole that was successively dug. A lofty female dancing a can-can would not have riveted the masculine gaze more intently than did each pole as it went end upward toward the perpendicular. No time was lost by the breathless gazers. A hasty lunch or no lunch at all, a minute inspection of each pole and a casual one of the workmen's lunch baskets at midday, was all that interfered with the rapt admirers from the rising of the sun unto the going down of the same. The punctuality of the crowd, too, testified to their keen enjoyment. We do not believe that one of them missed a pole, which argues well for the relish of the mob and the interesting character of the performance. Doubtless the watchers will block the corners of Fayette street, now that the pole raising is over, and spend the day sneezing at the steeple of the new City Hall.

Journal of the Telegraph.

This Journal is issued on the 1st and 15th of each month. Its circulation is over 8,000. It goes to every State, Territory and Province on the Continent. It has become a necessity, and is always welcomed as a friend. No better medium for advertising exists.

TERMS:

TWO DOLLARS PER ANNUM IN ADVANCE.

Address—

JOURNAL OF THE TELEGRAPH,

Western Union Telegraph Company,

145 Broadway, New York.

NEW YORK, MAY 15, 1874.

At the annual meeting of the stockholders of the Pacific and Atlantic Telegraph Company at Pittsburgh, Pa., on Tuesday, May 5, Hon. William Orton was elected President, and the following named gentlemen Directors, for the ensuing year: George H. Mumford, Norvin Green, Roswell H. Rochester, of New York; William G. Johnston of Pittsburgh, Frederick V. Beisel and David H. Bates of Philadelphia.

The greater number of the offices of the Western Union Company are supplied with the JOURNAL direct from this office, but a large portion are supplied by Superintendents, who receive the papers in bulk. As it is impossible for us to know which among the list of offices newly opened should be supplied direct, will Superintendents please notify us of the manner in which the papers should be sent?

QUITE a number of offices interpret the Executive Orders continuing the force of the complimentary franks of 1873 until certain dates in 1874 as covering also the business franks issued for the first-named year. These franks are entirely distinct. An order bearing upon either has no relation to the other unless it is so specified.

THE attention of managers of offices is called to Rule 50, regarding the forwarding of the originals of all free business sent during the month. Many of offices neglect to endorse upon the message the amount of tariff which would have been chargeable had the message been paid for, and also the reason for sending free. This neglect entails much trouble and considerable correspondence at the Audit Department, which would be avoided if the message showed a proper check.

THE BREAK IN THE CUBAN CABLE.

The break in the Cuban Cable of 1873 was found in the shore end, about two miles from the Cable hut. The cable had evidently been cut, either with a cold-chisel or an axe, and the supposition is that it had been caught by an anchor and this means taken to get clear of it. The two ends of the broken cable were found about three hundred feet apart. Under the directions of the Secretary of the Navy, Admiral Scott, commanding the North Atlantic Squadron, detailed the steamer "Pinta," commanded by Captain Dyer, to assist in the repairs of the cable. Captain Dyer, who is a very energetic and efficient officer, rendered very valuable service in picking up the cable, but unfortunately, before the work of under-running was completed, sickness broke out on the "Pinta" and she was placed in quarantine. At this juncture, Captain Seeley of the Lighthouse Department tendered the use of the steamer "Geranium," which is employed in setting buoys in the neighborhood of Key West, to assist in the cable work. This timely aid was of the utmost value to the Company, as it enabled the repairs to be made without delay.

The arrangements for underrunning, which had to be improvised from such materials as could be picked up at Key West, coupled with Mr. Mackintosh's valuable experience in sub-aqueous telegraph cable repairs, proved quite adequate for the occasion, and, when the weather was fine, enabled the cable to be underrun with facility until the break was found.

While testing the cables from the cable huts at Key West, Mr. Prescott and Mr. de Bree observed that the earth plates produced large deflections upon the galvanometer employed. The north cable hut is situated about half a mile north, and the south cable hut about a mile south of the office. At each place, including the office, the ground plate consists of a large sheet of copper, well buried in the earth. The first observation was made at the north cable hut, where the cable hut ground sent a positive current into the conductor of the Punta Rasa cable. The north cable hut ground was then connected through a Clark's galvanometer with the cable armor, sending a positive current into it, and deflecting the needle 50°.

The office ground was then connected in the same way with the cable armor, and gave a positive deflection of 60°.

The office ground was then connected with the cable hut ground and sent a positive current into the latter.

The following experiments were subsequently made the same day at the office:

The north cable hut ground was connected with a water pipe and gave a positive deflection of 20°. The south cable hut ground was then connected with the water pipe and gave a positive deflection of 22°. The south cable hut ground was then connected with the north cable hut ground and gave a positive deflection of 2°.

The north cable hut ground connected with the cable armor through Clark's galvanometer, with 100 shunts in on both sides, gave a positive deflection of 30°. One Daniell cell connected with same galvanometer, double shunted, gave a deflection of 39°.

A subsequent test made the day following at the south cable hut gave the following result: South cable hut ground connected with cable armor gave a deflection of 70° on Clark's galvanometer, and a deflection of 5° through 13,000 ohms resistance.

THE example of the American District Telegraph Company, which was the pioneer in the movement of putting its messengers in uniform, has now been followed by the Atlantic and Pacific, and Franklin Telegraph Companies, who have equipped their messengers in uniform suits of gray, with scarlet trimmings. The boys present a neat appearance, nearly equaling those of the American District Company, which it would be difficult to excel.

A BILL has been introduced in the House of Representatives by Mr. McCormick to protect lines of telegraph constructed or used by the United States from malicious injury or obstruction, which was referred to the Committee on Military Affairs. It provides that any person or persons who shall willfully or maliciously injure or destroy any of the works, or property, or material of any telegraphic line constructed or in progress of construction by the United States, or that may hereafter be constructed or owned, occupied or used by the United States, or who shall willfully or maliciously interfere in any way with the working or use of any such telegraphic line, or who shall obstruct, hinder or delay the transmission of any communication over any such telegraphic line, shall, on conviction thereof, be deemed guilty of a misdemeanor, and be fined not less than one hundred nor more than one thousand dollars, or with imprisonment for a term not exceeding three years, or with both, in the discretion of the Court.

THE Auburn (New York) *Advertiser* tells us of the freaks of lightning in that city on Thursday night, while Charles E. Cheesbro, night operator at the telegraph office, was working the wires. After amusing itself for a moment it exploded with a terrific force, hurling a shower of sparks about the office and densely enveloped the room in a choking volume of sulphuric smoke. No serious damage ensued, although the heat was sufficient to melt the ground plate composed of brass an eighth of an inch in thickness where it came in contact with it. The bolt entered the office in the shape of a lurid ball of fire, and had it not encountered the ground plate, which serves as the operator's lightning rod, would have created sad havoc with the batteries and telegraph apparatus, and would undoubtedly have entailed loss of life.

At a meeting of the Directors of the American District Telegraph Company on Thursday, April 30th, the resignation of H. L. Hotchkiss, Secretary and Treasurer of the Company, was presented. It was accepted, and a complimentary acknowledgment was made of the retiring officer's abilities and strict attention to duty. Mr. Greenleaf was chosen to succeed him, and C. B. Hotchkiss was appointed Secretary and Assistant Treasurer.

THE NEW CODE OF RULES.

From New Orleans.

RULE 6.—Add after word "transmitted," unless they are duplicates of amounts or numbers immediately preceding them, in which case each group of five figures, or fraction of five, shall be counted and charged for as one word. Thus: "hundred fifty-six, 156," four words; "two hundred and fifty six, 256," six words; "eighteen thousand one hundred fifty-six, 18,156," seven words; "one hundred and eighteen thousand one hundred and fifty-six, 118,156," twelve words.

(This gives the sender the option, for his own safety, of duplicating in figures amounts or numbers. The telegraph will not lose by such a rule, for it will generally gain the price of one word, and will often prevent mistakes.)

RULE 9.—Names of cities and places, when used in the body of a message to designate such places or things, such as steamers or hotels, shall be counted according to the distinct number of words in each. Example—places: New York, New Orleans, St. Louis, United States, each two words. Steamers: New York, two words; Maid of the Mist, four words. Hotels: St. Louis Hotel, New York Hotel, United States Hotel, three words each; Burnet House, two words. Surnames to be counted according to present rule.

Words connected by a hyphen, as found in full faced type in Webster's Dictionary, shall be counted as one word. No exception on account of custom, common usage, &c.

RULE 10.—Whenever a message is to be dropped in the Post-Office, the address should contain the initials D. P. O. Example: John Doe, D. P. O., Boston; and the drop letter postage should be collected (if the Company thinks proper) and entered for other lines. When the message is for some person at a place where there is no telegraph office, the address should be, for example, John Doe, Doeville, Mass., mail Boston, and three cents postage collected and accounted for, as for other lines.

Whenever a message is to be forwarded by express or special messenger the address should be, for example: John Doe, Doeville, Mass., "Care Adams Express" or "Care Special Messenger," Boston, and the three words so embodied in the address shall be counted and charged for; and a reasonable deposit shall be taken in all such cases and retained till advice by mail is received of the expense so incurred. When the mail cannot be waited for, then let the address be: John Doe, Doeville, Mass., care Adams Express, advise cost, Boston; or care Special Messenger, advise cost; and the two additional words "advise cost" shall also be counted and charged for. For the return advise one-half rates shall be collected.

RULE 11.—Whenever the sender of a message desires an answer, he should be required to limit the reply to a certain number of words; say ten, twenty, thirty-five, or unlimited, and having paid or secured payment of same, the Code figures 331, 332, 335, or 339 (signifying respectively, reply 10 w., 20 w., 30 w., or unlimited, paid), shall be inserted in the message immediately before the signature, and shall not be counted or charged for. The delivering office shall place in the envelope with such messages a card, upon which it shall be stated that an answer of the designated number of words has been paid for; the bearer will wait five minutes for it.

(The card should have the figures 10, 20, 35, or the word unlimited, printed in large type, to prevent mistakes by clerks.)

No collect messages, unless they are answers to

messages containing the Code figures given above, shall be sent on any account whatever.

From Quebec.

It appears to me, judging from the suggestions made in THE JOURNAL, that the system of counting and charging for messages is one very great obstacle to the simplification of your work.

Your tariff is cumbersome, and has too many rates such as 40 and 3, 45 and 3, 50 and 3, which might all go in a three cent a word rate; but it would be better to have still fewer rates, say four only, 2 cents, 4c., 8c., and 16c. a word, chargeable by States, and therefore quickly memorized or referred to.

Abolish the 10 word rate and count every written word, only excepting the check of paid messages, operators' initials, and Code time.

Add the words "via ———" to the check of business to and from other lines, and charge for them.

Let your two cent rate cover business between adjoining States, and let each rate extend as far as possible, abolishing half rates, which would not be so much required, as they could be replaced by commercial people with ciphers of few words, as in cable business.

Call your 2c. tariff A, 4c. B, 8c. C, 16c. D, and check paid passages "20 A" or "30 C." If insured "20 double A." When collect, "30 collect 60," charging for three words.

Abolish free office business, giving senders the option of registering for a small fee, which will insure notice of delivery or non-delivery. An additional letter to the check will show the registration. A similar method for answers, and a code might be arranged for such notices.

Use a code time (say Washington or New York) for the whole country, and time all business by it. Let each message carry the time of its receipt at the originating office, thus showing on its face of any needless delay.

From Raleigh, N. C.

Would suggest having "Night Telegram" printed on Blank No. "45," so customers can distinguish them; oftentimes write Day Message on half-rate blanks.

From Cleveland, O.

Messages should not be sent spelled incorrectly. Receiver should see that words are written correctly before sending to operator for transmission.

Every office using an instrument on a wire for the transmission of business, shall have equal privileges with other offices on that wire.

Offices who have but few messages for daily transmission should be given the privilege of the circuit at least once an hour.

All remarks as to the count of words in a message should be made at the end of the check, and not immediately following the word whose count may be in doubt.

From Indianapolis.

I would suggest that all employes of the Western Union Telegraph Company be required to sign a pledge to abstain from the use of all intoxicating liquors so long as they remain in the service of the Company.

It is suggested by seeing the enclosed item:

"All telegraph operators engaging with the Grand Trunk Railway are required to sign a pledge of total abstinence from all intoxicating liquors. This pledge is required of all other operators of that road as well."

From Godfrey, Ill.

1st.—Many Managers of R. R. offices are employed as agents, operators, clerks, etc., and are *ex-officio* managers of telegraph offices; they have many irons in the fire, and cannot well spare time [from other

and frequently paramount duties, to deliver four or five messages daily to points about half a mile distant, more or less, besides delivering others within easy distance from the office. Would suggest that Rule 58 provide for this, after the following plan:

Charge for $\frac{1}{4}$ mile,.....	free.
" $\frac{1}{2}$ ".....	10c.
" $\frac{3}{4}$ ".....	15c.
" 1 ".....	25c.
" 1 to 2 miles.....	50c.
" each additional mile over 2 miles, \$1.....	25c.

This schedule for ordinary use. Discretionary power to be given in case of bad weather, over bad roads, etc., etc. Make it the business of every receiver to obtain full address, and ascertain if party to whom message is intended lives within office delivery, and, if not, how far beyond delivery; and if beyond delivery, to get instructions as to manner of delivery by mail or messenger. Especial care to be taken with messages for "small offices." Half the messages I receive are for parties beyond delivery, say from one to four miles, nothing said about delivery, then follows the usual round of office messages, the inevitable delay—all of which could be avoided by the receiver's exercising a little care and common sense. So much for delivery.

2d.—Guarantees may be well enough in cities where the word of a well-known business man is supposed to be as good as his note, but they are little use with "country customers," who care little for notes and much less for promises. Make a rule that every original message, i. e., not an answer, must be prepaid, also the answer, if it calls for one. Don't look to the operator to make it up if he fails to get tolls from the customers, but look to the customer himself. Abolish the guarantee business, in the rule plainly, in so many words. Make the penalty for violation of the rule dismissal, not a "go down" on the operator's pocket, which is the practical result of present system. Think such a rule and such a penalty to fall back upon would result in the collection of tolls, but don't think any one would be dismissed. Operators would cease to pay for "dead beats," and the avenues of dead-beatism would be closed. A certain class of customers like a loose way of doing business, and will insist upon looseness just as long as they can profit by it.

So far as city offices are concerned, this matter of the "new code" will be thoroughly sifted, without doubt, but think the code will be minus a few good points if our "country cousins" do not speak out in time. Let us hear from them. More anon, about special rules.

BOARDING TELEGRAPH OPERATORS.—The Brooklyn *Argus* is responsible for the following:

A widow lady who started a boarding-house for telegraph operators in this city lately, found herself at the end of the month bankrupt in purse and minus her two daughters. Her guests had disappeared also, leaving [behind them an old Saratoga trunk containing two bars of piglead, a dozen tomato cans, and a badly worn Bible. On the fly-leaf of the book were several quotations from the Latin poets, such as "Three of a kind beat two pair." "Play the ace to win." "Copper on the deuce." "Take it sweet, with a little lemon," &c.

NEVER be sorry for any generous thing that you ever did, even if it was betrayed. Never be sorry that you were magnanimous, if the man was mean afterwards. Never be sorry that you gave. It was right for you to give, even if you were imposed upon. You cannot afford to keep on the safe side by being mean.

[CARD.]

THE "SNAPPER" SOUNDER.

PATENT



QUARREL.

A view taken from the other side of the fence.

The following correspondence is a partial exposure of the vapory foundation upon which rested the flaming advertisement in the JOURNAL of May 1st, 1874, wherein it was claimed that Walter J. Barron had secured a patent on the base of the "Snapper" sounder:

[Telegram.]

New York, May 11th, 1874.

J. S. BROWN,

Solicitor of Patents,

615 7th Street, Washington, D. C.

Barron's agents advertise patent granted him May 1st, for base of the "Snapper" sounder. Your client, Mr. Wassmann pronounces this statement false. Can I contradict it authoritatively in next issue of the JOURNAL OF THE TELEGRAPH? Answer.

R. W. POPE.

[Reply.]

WASHINGTON, May 11th.

R. W. POPE,

61 Broadway, N. Y.

You can contradict it emphatically. There is no truth in it.

J. S. BROWN.

One fact proves that the statement referred to was incorrect. All patents issued for the week, are dated on Tuesday following. As May 1st, occurred on Friday, the patent, if allowed, would have been dated on the following Tuesday, May 5th.—and this fact is well known to all parties having business with the Patent Office.

No Patent Solicitor, therefore, would, unless through inexcusable carelessness, have made such a communication to a client, as was alleged to have been made in regard to the patent on the "Snapper" Sounder.

With sublime impudence, the public was notified in the same advertisement, that the "Snapper" Sounder had been superseded, and was hereafter to be known by another title.

This was certainly the unkindest cut of all, after the introduction of the article through the United States, under a trademark for which I had taken the pains to secure a patent. As this change was authorized by neither the State Legislature nor Act of Congress, probably no arrests will be made of any parties who apply to the article its original and popular name.

The "late Manager of the American District Telegraph Company," evidently labors under the impression that he is still cracking the whip of discipline over a score of messenger boys.

Notwithstanding this threatening proclamation, I assure my friends that I am still in a position to fill all orders, with my usual promptness, and that in dealing with me they violate the U. S. patent laws no more than they would in the purchase of a bar of soap from a corner grocery.

R. W. POPE,

New York, May 13, 1874.

The "Snapper" Sounder,

PATENT APPLIED FOR.

New

New

STYLES. PRICES.

The unexpected and growing demand for the original "Snapper" Sounder, beyond the expectations of the manufacturers, has delayed the introduction of proposed styles and improvements.

Having increased our facilities and accumulated sufficient stock to enable us to fill orders promptly, the following varieties are now offered for sale at prices which will accommodate all classes.

The "Snapper Sounder," plain, 30c. or 6 for \$1.50
 " " polished, 35c. or 6 for 1.80
 " " polished & plated spring, .40

A few were manufactured to order, with hard rubber knobs. They were so well liked that I have decided to introduce them to the fraternity. The springs are secured by two screws, and in case of breakage may be replaced at an expense of 15 cents. They are thoroughly made and finished.

PRICE 75 CENTS.

A liberal discount to agents.

Canadian customers will please remit 5 cents extra for postage.

R. W. POPE,

Box 5278, N. Y.

F. L. POPE & CO.,
 38 Vesey Street,
 Agents for N. Y. City.

Electricity and Magnetism,

By FLEEMING JENKIN, F. R. S.,

ILLUSTRATED WITH 174 ENGRAVINGS,

12mo. Cloth, - \$1.50.

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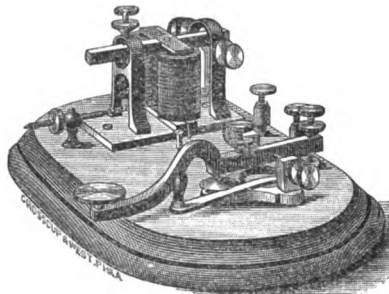
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THE PENNSYLVANIA TELEGRAPHIC AGENCY,

WAVERLY HEIGHTS, PENNSYLVANIA.

PEERLESS.



Nickel Plated.

FULL SIZE RAILROAD SOUNDER AND KEY.

NOTHING MADE OF CAST OR PAINTED IRON. Is finely finished, mounted on Walnut base.

1 cell Callaud Battery, office wire, chemicals, copy Smith's Manual, sent C. O. D. \$12 50
 If money be sent in advance by registered letter 12 00
 Instruments without Battery 11 50
 Telegraphic and Electrical goods of every description at manufacturers' lowest prices.

Send for Circular.

Red Star Line

PHILADELPHIA AND ANTWERP,

Appointed to carry the Belgian and United States Mails.

The following Steamers are appointed to sail FOR ANTWERP.

From Philadelphia.	From New York.
VADELAND, May 2.	SWITZERLAND, May 16.
CYBELE, May 23.	June 6.

FROM ANTWERP.

For Philadelphia.	For New York.
CYBELE, April 29.	May 13.
VADELAND, May 27.	June 10.

PRICES OF PASSAGE IN CURRENCY.

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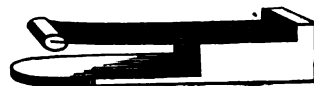
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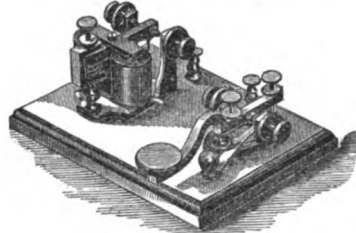
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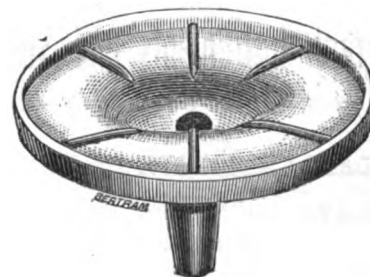
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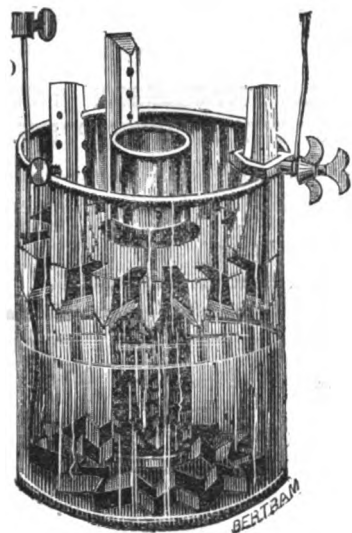
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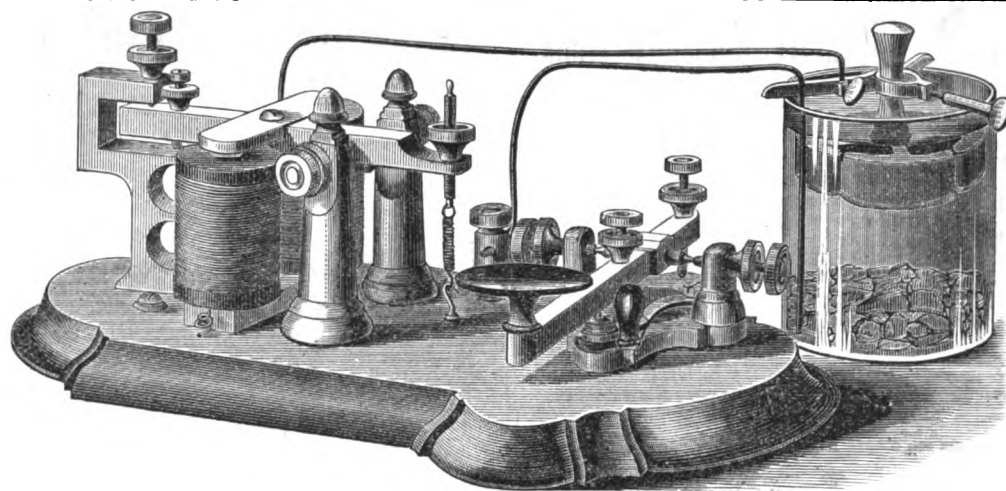
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JOURNAL OF THE TELEGRAPH.

VOL. VII. NO. 11.

NEW YORK, JUNE 1, 1874.

WHOLE NO. 158.

TABLES TO FACILITATE THE CALCULATION OF STRAINS OF OVERHEAD LINE WIRES.

By ROBERT SABINE.

TABLE I.

STRAINS ON SUSPENDED (IRON OR STEEL) WIRES.

COL. 1.			COL. 2.	COL. 3.
Relation of Sag to Span.			Proportional Strain.	Proportional Length. (Span = 1.)
H.	:	L.	K.	L.
1	to	10	4.67	1.02667
1	"	15	6.62	1.01185
1	"	20	8.68	1.00667
1	"	25	10.74	1.00427
1	"	30	12.83	1.00297
1	"	35	14.92	1.00218
1	"	40	17.02	1.00167
1	"	45	19.11	1.00132
1	"	50	21.21	1.00107
1	"	60	25.43	1.00074
1	"	70	29.64	1.00054
1	"	80	33.86	1.00043
1	"	90	38.07	1.00033
1	"	100	42.29	1.00027
1	"	110	46.52	1.00022
1	"	120	50.74	1.00019
1	"	130	54.96	1.00016
1	"	140	59.18	1.00014
1	"	150	63.40	1.00012
1	"	160	67.63	1.00010
1	"	170	71.85	1.00009
1	"	180	76.07	1.00008
1	"	190	80.30	1.00007
1	"	200	84.52	1.00006
1	"	225	95.08	1.00005
1	"	250	105.64	1.00004
1	"	275	116.21	1.00004
1	"	300	126.77	1.00003
1	"	350	147.89	1.00002
1	"	400	169.02	1.00002
1	"	450	190.14	1.00001
1	"	500	211.26	1.00001

RULES FOR USING THE ABOVE TABLE.

I.—The span and sag being given to find the absolute strain per square inch section.

RULE.—In column 1, find the nearest relation of sag to span, and opposite to it (in col. 2) the proportional strain (K). The absolute strain in lbs. is K times the span in feet.

EXAMPLE.—If a steel wire were to be stretched across a river (span 2,340 feet), and on account of shipping, only 39 feet sag could be allowed, what would be the absolute strain?

$$39 : 2340 :: 1 : 60.$$

In the table opposite the proportion 1 : 60 is given (col. 2) the proportional strain (K) = 25.43 lbs. The absolute strain, is, therefore, 25.43 × 2340 = 59,506 lbs. per square inch.

II.—The span and sag being given, and also the sectional area of the wire in square inches, to find the actual strain in lbs.

RULE.—In column 1, find the nearest relation of sag to span, and opposite to it (in col. 2) the proportional strain (K). Then the actual strain in lbs. is—

$$K \times \text{area of wire} \times \text{span in feet.}$$

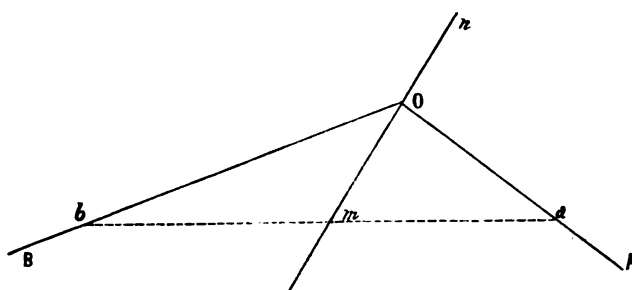
EXAMPLE.—Span of 111 yards with a sag of 20 inches (= 1 to 200). Required the actual strain of a No. 11 B. W. G. iron wire? In col. 1, opposite 1 : 200, we find K = 84.52. The sectional area of No. 11 wire is = 0.0125 sq. inch. Therefore the actual strain will be—

$$84.52 \times 0.0125 \times 333' = 352 \text{ lbs.}$$

III.—The span and sag being given to find the length of the suspended wire.

RULE.—In column 1, find the nearest relation of sag to span : col. 3 gives the proportional length (L). The actual length is = L times the span in feet.

EXAMPLE.—Span 200 feet; sag 10' (= 1 : 20). The proportional length of which is 1.0067. Therefore, length = 1.0067 × 200 = 201.34 feet.



IV.—The span and maximum actual strain of a wire being given, to find the necessary sag.

RULE.—Divide the given maximum strain in lbs. by the area of the wire in inches multiplied by the span in feet, and with the quotient refer to col. 2 of the table for the nearest value. Opposite to this in col. 1, you will find the sag.

EXAMPLE.—It is wished to stretch a No. 8 steel wire across a space of 2,000 feet in such a way that the maximum strain upon it will not exceed 900 lbs. The area of No 8 wire is 0.023 sq. inch, and

$$\frac{900}{0.023 \times 2000} = 19.565$$

In col. 2 the nearest value to 19.565 is 19.118 corresponding to a sag of 1 : 45. The sag will, therefore, have to be—

$$\frac{2000}{45} = 44\frac{1}{2} \text{ feet.}$$

V.—Two neighboring spans of different lengths which do not form an angle at the Post being given, to find the sag which one wire must be allowed in order to balance the strain of the other on the common support.

RULE.—Having found the actual strain of the first

section, the sag of the second is calculated by the Rule IV. given above.

EXAMPLE.—A span of 2,000 feet is crossed by a No. 8 wire (area = 0.023 sq. inch) having 44½ feet sag (1 : 45), and, therefore, an actual strain of

$$19.11 \times 0.023 \times 2000 = 879 \text{ lbs.}$$

The neighboring span is only 400 feet—

$$\frac{879}{0.023 \times 400} = 95.5 \text{ (See Rule IV.)}$$

In col. 2 the nearest value to this is 95.08, corresponding to a sag of 1 : 225. The wire must, therefore, be pulled up till the sag is—

$$\frac{400}{225} = 1.8 \text{ feet or about 21 inches.}$$

VI.—Two neighboring spans having different strains, and making an angle at the Post being given, to find the proper direction for a strut or stay.

RULE.—Find by the foregoing rules the two strains. Measure off from the pole in the direction of each wire, a length proportional to its strain. Join the ends of the measured lengths by a straight line, the middle point of which sighted towards post gives the proper line of strut and stay.

EXAMPLE.—From the post O (figure 1) are two wires. The strain of A is 600 lbs., that of B is 900 lbs.

I measure off in the direction OA, a length of 10 ft. to a, and in the direction OB, a length of 15 feet to b (because 10 and 15 are proportional to 600 and 900). The points a and b I then join by a straight line, a b, the middle of which is at m. Therefore, a strut should be placed in the line m O. If I want a stay, I sight the line on the other side of the Post towards n, and

place the stay in the direction n O.

VII.—The span, sag and temperature (in deg. centigrade) of a wire being given, to calculate the effects of an alteration of temperature.

RULE I.—Take from col. 8 of the table the proportional length corresponding with the given span and sag.

II.—Then $\left\{ \begin{array}{l} \text{increase} \\ \text{decrease} \end{array} \right\}$ this proportional length by 0.0012% for every degree centigrade which the altered temperature is $\left\{ \begin{array}{l} \text{above} \\ \text{below} \end{array} \right\}$ the original temperature.

III.—Lastly, with the altered proportional length, find (in col. 3) the nearest value, and in col. 1, the corresponding sag. The proportional strain in col. 2 multiplied by the span in feet, gives the resulting strain in lbs. per square inch of section.

EXAMPLE.—An iron wire was stretched across a span of 400 feet, with a sag of 5 feet (1 : 80) at a temperature of 25°C. The absolute strain upon it was therefore 400 × 38.86 = 15,544 lbs. per square inch. In Winter, during a frost of -5°C., what would the sag and strain become?

1.—By col. 3 we find that the proportional length for sag 1 : 80 would be 1.00042.

2.—The difference of temperature (+25° to —5°C.) would be 30° and $30 \times 0.0012\% = 0.0036\%$. Then $1.00042 - 0.0036\% = 1.00042 - 0.000036 = 1.00006$.

3.—In col. 3 we find the proportional length 1.00006 corresponding to a sag of 1 : 200, and (col. 2) a strain of about 85 lbs. $85 \times 400 = 34,000$ lbs. per square inch, which would be sufficient to permanently stretch the wire.

VIII.—To find the actual $\left\{ \begin{array}{l} \text{stress} \\ \text{strain} \end{array} \right\}$ on a given $\left\{ \begin{array}{l} \text{strut} \\ \text{stay} \end{array} \right\}$ placed in the proper direction.

RULE 1.—Mark out by the method given in Rule VI. the line of direction, and measure the distance $m O$, in feet. The horizontal strain on the post in the direction $n m$, is equal to the actual strain on A in lbs., multiplied by twice $m O$, in feet, and divided by $O a$, in feet.

2.—Next measure downwards and mark from the point where the $\left\{ \begin{array}{l} \text{strut} \\ \text{or stay} \end{array} \right\}$ joins the post, a length of 10 feet, on each; and, with a tape, measure the distance across in feet, between the two marks.

3.—Find in Table II. (col. 1) the nearest value to this distance, and, with the corresponding figure (in col. 2) multiply the horizontal strain found (in 1) above. The product is the actual strain on the $\left\{ \begin{array}{l} \text{strut} \\ \text{or stay} \end{array} \right\}$ in lbs.

TABLE II.
STRAINS ON STRUTS OR STAYS.

COL. 1.		COL. 2.
Distance between Strut or Stay, and Post 10 feet down.		Proportional strain on Strut or Stay.
Feet.	Inches.	
2	0	5.02
2	3	4.47
2	6	4.03
2	9	3.67
3	0	3.87
3	3	3.12
3	6	2.90
3	9	2.71
4	0	2.55
4	3	2.41
4	6	2.28
4	9	2.17
5	0	2.07
5	3	1.89
5	6	1.75
5	9	1.63
6	0	1.58
6	3	1.44
6	6	1.36
6	9	1.30
7	0	1.24
7	3	1.20
7	6	1.16
7	9	
8	0	
8	3	
8	6	
8	9	
9	0	
9	3	
9	6	
9	9	
10	0	
10	3	
10	6	
10	9	

EXAMPLE.—The post in the example given with Rule VI. is provided with a stay in the line $m O$. The length of the line $m O$, by measurement I find to be 6'. The horizontal strain on the post is therefore

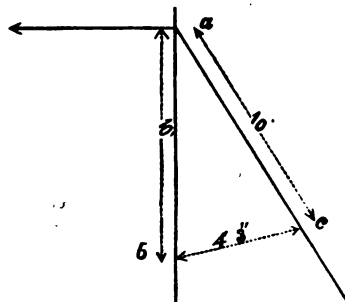
$$\frac{600 \times 2 \times 6}{10} = 720 \text{ lbs.}$$

I next mark off from the point (a) 10 feet (to b on the post and to c on the stay) and measure the distance across from b to c , which I find to be 4' : 3". (Fig. 2.)

Lastly, I refer to Table II., and opposite 4' : 3" I find 2.41

The strain on the stay is therefore $2.41 \times 720 = 1735$ lbs.

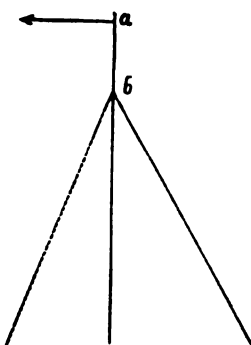
In this rule it is supposed that the strut or stay touches the Post at the same height as the mean strain acts horizontally.



If, however, the strain acts higher or lower than the top of the strut or stay, the result found by the last rule must be multiplied by the height of the strain, and divided by the height of the top of the strut or stay, both being measured on the Pole.

EXAMPLE.—Suppose in the last example the mean strain acts at 20 feet from the ground, but that the stay reaches only 15 feet up, (figure 3) then the actual strain will be

$$\frac{1735 \times 20}{15} = 2313 \text{ lbs.}$$



IX.—The resultant horizontal strain of the wires in the proper direction of a $\left\{ \begin{array}{l} \text{strut} \\ \text{or stay} \end{array} \right\}$ and the maximum strain which the $\left\{ \begin{array}{l} \text{strut} \\ \text{or stay} \end{array} \right\}$ is to bear being given, to find the angle at which it must be placed against the Post.

RULE.—(1.) Find by Rule VIII. (1) the horizontal strain in lbs., acting in the proper direction of the $\left\{ \begin{array}{l} \text{strut} \\ \text{or stay} \end{array} \right\}$.

(2.) Divide the given maximum strain in lbs. by the horizontal strain in lbs., and find in col. 2, Table II., the nearest value to the quotient; col. 1 then gives the distance which the $\left\{ \begin{array}{l} \text{stay} \\ \text{or strut} \end{array} \right\}$ must stand from the post at a point measured 10 feet down on each.

EXAMPLE.—Suppose the horizontal strain calculated by Rule VIII. (1) to be, as in the last example — 720 lbs.; and that a stay which must not bear more than 1,500 lbs., is to be used—

$$\frac{1,500}{720} = 2.08.$$

In col. 2, Table II., the nearest value to this is 2.07, and in col. 1 the corresponding distance between the 10 ft. marks is given, — 5 ft.

In dealing with overhead telegraph wires, the actual strain may be, without sensible error, taken as the horizontal strain, because they are generally allowed so little sag.

THE LAWS OF STORMS.

BY PROF. ELLAS LOOMIS.

This memoir was entitled Results Derived from an Examination of the United States Weather Maps for 1872 and 1873. It was a continuation of the researches concerning which Prof. Loomis presented a memoir at the academy's meeting last October. The material employed in these investigations is the United States weather maps for the years above named, one map daily at 7½ A. M. being selected. The method employed is to plot out the line of storms on skeleton maps, month by month, reduce the paths to tabular forms by means of a protractor measuring, with reference to a meridian, and thus ascertain the progress of each storm on a scale of inches. Reduced thus to tabular form, the highest velocity is found in February, 31 miles per hour; the lowest in August, 17.7 miles per hour; the average for the year, 25.6 miles per hour. The average direction of the storm paths for the year is N. 83° E., and is found to be 33° more northerly in October than in July; the velocity in February is 75 per cent. greater than in August.

The diversity of the direction and velocity of particular storms much exceeds these averages. On October 20, 1873, a storm traveled N. 44° W.; on October 25, 1872, N. 18° W.; on May 10, 1873, N. 160° E., or S. 20° E., showing a range of storm paths of over 180°. The velocities have a range from 0 to 57.5 miles per hour. As the mean values of the storm paths would thus form a very uncertain guide in predicting their velocity and direction, Prof. Loomis undertook an investigation of the disturbances accompanying the storms, using the material afforded by the weather maps. There seems to be a direct connection between the fall of rain and the course of a storm path. The rain fall of each storm was therefore collated, and the distance on each side of the path to which the rain extended. The whole number of storm paths was then divided into four classes, according to their respective velocities, with the following results in 152 cases.

Velocity in miles per hour.	Extent of rain area in miles.	Velocity in miles per hour.	Extent of rain area in miles.
38.8	590	21.6	503
28.5	548	14.5	365

These numbers indicate that the rain area generally extends 500 miles eastward of the storm centre; that when the rain area exceeds that extent the storm advances with a velocity greater than the mean, and when the rain area is less the velocity is below the mean. The comparative acceleration or diminution of velocity can be deduced from the table.

A similar class of comparisons to ascertain the connection of rainfall with the direction of the storm gave the following results:

Course of the Storm.	Axis of rain area.
N. 40° E.	N. 53° E.
N. 116° E.	N. 118° E.

The average course of the storm paths for twenty-four hours coincides very closely with the portion of the axis of the rain, and for the preceding eight hours.

By dividing the paths of seventy-nine storms into quadrants the following table of the prevailing winds was obtained:

N. quadrant.	S. quadrant.	E. quadrant.	W. quadrant.
7.6	8.8	8.3	10.1

By further comparisons of extremes of velocity of storms and prevailing winds the following result was determined:

Velocity of storm in miles per hour.	Velocity of wind in E. quadrant.	Velocity of wind in W. quadrant.
32.1	8.8	9.0
18.1	7.8	11.3

These numbers show that the stronger the wind on

the west side of the storm, the less is the velocity of the storm's progress. When the velocity in the east quadrant is equal to that in the west quadrant, the velocity of the storm is seven miles greater than the mean; but when the velocity of the wind in the west quadrant exceeds that in the east by 45 per cent., the velocity of the storm's progress is seven miles per hour less than the mean.

Prof. Loomis then explained the process by which he applied similar computations of the relative velocities of the winds, &c., at high altitudes, such as that of the Signal Service stations at Mount Washington; coming to the conclusion that at the height of 6,000 feet in the western quadrant of a storm, the velocity of the wind is more than double that of the storm. By another series of computations he obtained the forms of the isobaric curves in at least 200 cases. In 55 per cent. of the whole number of cases the major axis of the isobar exceeded its minor axis by half its length; in 30 per cent. the major was double the minor; in three per cent. the major axis was at least four times the minor. The storms of the United States are mostly of an oval form, with the longer axis most frequently in a direction about N. 40 E. About three-quarters of the great storms originate in the extreme west. In a case of which the details were particularly reviewed it seemed probable that the first development of magnitude in a storm began with the collision of moist air from the Pacific Ocean against the peaks of mountains in Oregon, resulting in heavy rainfall. But the most remarkable fact elicited was, that the storm, once originated and organized, traveled over the highest mountain ranges without indicating sensible obstruction, proceeding eastward across the whole continent of North America.

DEPERDITION OF MAGNETISM.—*M. Jamin.*—The common idea is that, at each temperature, t , steel takes a certain magnetization, which is less as t is higher, and which it retains on cooling. This is not correct. M. Jamin placed a bar, heated in a sand-bath, so as to receive the blue color of springs, in a bobbin traversed by a current, and retarded its cooling (by a suitable arrangement). The steel took somewhat less magnetism than if it had been cold. Then he broke the circuit, and, on examining the remanent magnetism with a proof contact, found it much greater than the bar would retain if first cooled (109 grms. instead of 54). Thus the coercitive force does not diminish with heating, but increases. But if the force of detachment be again measured minute by minute it is found to decrease, at first very rapidly, then less so, till in a quarter of an hour it has quite disappeared; and this, whether the bar be kept hot or allowed to cool naturally. The transition is almost continuous from total magnetization to remanent, which in time descends to zero. Now re-heat the bar, but to a less temperature. Its total magnetization (while the current passes) is greater than in the former case; but immediately on breaking the remanent magnetism is less than in that case; on the other hand, it disappears less quickly, and never entirely. Again, begin without heating the bar. The total magnetism is still greater; the remanent (on breaking) still smaller, and invariable with the time.

PLINY gives the origin of glass-making thus. As some merchants were carrying nitre, they stopped near a river issuing from Mount Carmel. Not readily finding stones to rest their kettles on, they used some pieces of nitre for that purpose; the fire gradually dissolving the nitre, it mixed with the sand, and a transparent matter flowed, which, in fact, was glass.

GALVANIC ELECTRICITY.

Put a rod of amalgamated zinc in a glass cell filled with dilute acid, and it will be seen that the apparent action is limited to the gradual production of a few bubbles of gas. On placing this copper wire in the cell beside the zinc, there is no change until I allow the two metals to touch, when you see torrents of bubbles are evolved from the surface of the copper wire. On substituting platinum or silver for the copper we get a similar effect, and that whether we join the metals within the liquid or at a point exterior to it. Thus, if I join the copper wire to this galvanometer, and connect the other end of the coil with the zinc rod, you see that the magnetic needle is deflected as long as contact continues; but immediately on breaking the circuit, the action on the needle and the evolution of bubbles cease instantly. Such an arrangement of two metals, in a liquid capable of acting on one of them, is called a galvanic battery, and by means of it, in connection with a very delicate galvanometer on the other side of the Atlantic, we are able to send telegraphic signals across the ocean.

From the fact that the bubbles of gas are given off from the surface of the copper, we might suppose that it was that metal which was acted upon; but if we were to weigh them, we should find that it was the zinc which had lost weight, while the copper remained quite unacted upon. The dissolved metal is known as the positive, and the unacted metal as the negative; in fact, there is less tendency to solution on the part of the copper when connected with the zinc than in the absence of the latter metal, which, on the other hand, is far more rapidly dissolved than it would be alone.—*Lecture by A. H. Allen, F.C.S.*

ELECTRO-SYMPATHETIC CLOCKS.

Among the many objects of interest in the recent Art Exhibition of Dundee, perhaps few things excited more interest among the visitors than a clock worked by electricity in connection with a normal or master clock. Messrs. Ritchie & Sons, of Edinburgh, whose names are familiar in connection with the time-gun signal, introduced the system some time since, and this system the present clocks are intended to illustrate. The master clock, which is one merely of an ordinary kind, requiring to be wound up periodically, is placed on the platform of the large hall. The oscillations of its pendulum are used to complete contact between the poles of a galvanic battery on the top of the clock case. There are two cells of the ordinary Daniell's sulphate of copper battery, one pole of each being placed in metallic connection with the gas pipe, and the other pole terminating in a slender spring, against which the pendulum rod impinges; and while contact is thus obtained alternately with one or other spring, a current of positive or negative electricity is sent through the pendulum rod, along the insulated wire connected with it to the other end of the hall, where the sympathetic clock is placed. This differs from previous electric clocks, and is provided with a magnetic pendulum, consisting of a wooden rod having a hollow coil or bobbin of insulated copper wire, the ends of which are attached to the suspension springs on which the pendulum is hung. A double bundle of permanent magnets is fixed in the centre of this bobbin, their similar poles being placed towards each other. An attraction to and repulsion from the poles of the magnet hung in the center of the coil is caused by the passage of the currents of electricity through the wire coil of the pendulum, in which motion is thus produced and maintained. The makers have constructed a simple but effective escapement, or rather

propellent, by which two arms are alternately raised by the pendulum out of action with the record wheel of the clockwork, and when released, by mere force of gravity, push forward the wheel work and hands by sudden and decided steps, which are thus registered by the hands of the clock. There is such a peculiarity in the construction of the pallets that no probable force can push forward the hands beyond the fixed stops, and no power less than the weight of the gravity arm will drive the wheel work backwards.

The difference between this system and that which works electric clocks hitherto in use is that the passing currents of electricity are employed merely to maintain motion in the pendulum, which is effected by a very weak battery; and from the great momentum, these currents may be intermitted or the wire cut for even two minutes at a time without destroying the coincidence of time shown by the sympathetic clock, which is dependent on the motion of its own pendulum, and not in any way upon the power of the battery. This allows the opportunity of causing several clocks attached to the same wire circuit to report their accuracy by making each clock at a certain second to cut the wire connection during that second, and thus the flow of the current is prevented. By means of a galvanometer placed in the wire these dropped seconds are observed, and the correctness of the respective clocks guaranteed. Whatever the number of the clock placed on the same wire circuit, all of them will, of course, act in unison with the beat of the normal or master clock.—*The Engineer.*

PRACTICAL USE OF VELOCIPEDES.

The bicycle, after going entirely out of fashion as a toy, is now being put to some practical use. Messengers, called "veloce men," thus mounted, convey dispatches in Paris from the Bourse—or stock exchange—to the central telegraph bureau. The distance is about six miles, going and coming, and is accomplished in 25 minutes, at a charge of 50 cents. A company has been formed to place a very large number of velocipedes upon the streets and to supply messengers to go to any part of the city. The Parisian journals are also using the bicycle to obtain quick reports. During the trial of Marshal Bazaine, the *Moniteur* employed daily a large number of vehicles, running from the palace of Versailles to Paris. The distance, about 13 miles, was made in 45 minutes, and quicker than the ordinary trains on the railroad. Carrier pigeons were also used by the papers, the birds easily traversing the distance above mentioned on clear days at the rate of a mile a minute.

THE AURORA BOREALIS OF FEBRUARY, 1874.—At the French Meteorological Society, M. Sainte Claire Deville stated that there are evidently recurring periods for these phenomena. M. Tarry mentioned that M. Bureau, director of the telegraph office of Nantes, observed the aurora of February 4th, 1874, in that city, and that he had been warned several hours before its appearance by magnetic currents appearing on the telegraph lines, especially those running east and west. In 1871 and 1872, M. Bureau devoted himself to some very interesting observations of these magnetic currents which precede, accompany and follow auroras. At Brest he was successful in prognosticating the approach of some auroras. With regard to the particular aurora in question he observed, from five o'clock in the evening, the precursory signs of a magnetic storm on his galvanometer, and he prepared to study the magnetic waves indicated by the needle. The storm lasted from 7.20 P. M. to 7.55 P. M., and during the whole of that time he watched its approach and departure.

CORRESPONDENCE.

To the Editor of the Journal of the Telegraph:

Whilst deeply appreciating the efforts of those gentlemen who are so unselfish as to place before the telegraph fraternity of this Continent so many interesting facts in connection with our business, I trust it is not unpardonable to point out some of the errors into which they occasionally fall, leaving myself open for similar friendly correction. In order to arrive at correct results it is necessary that the processes should be accurate. In the *Telegrapher* of March 28, Mr. Pope gives a well-written article on Insulation, but, by some oversight, the formulas near the foot of the first column have got reversed, and without some correction will tend to confuse and mislead the student. Calling R — the apparent insulation resistance, and r — the apparent conductivity resistance; the corrected or absolute insulation resistance is given by $\sqrt{R(R-r)}$, and the corrected or absolute line resistance by $2R - \sqrt{R(R-r)}$.

It is a matter of great importance to eliminate the wire and insulation resistance from the apparent measures. For example: Wire A, from Chicago to Toledo, 224 miles, has an apparent conductivity resistance of 10,000 ohms, and wire B, by its side, measures only 8,000, the apparent insulation of each being 45,000. According to the usual rough mode of calculation the insulation resistance per mile each would be made to appear the same (9,980,000) whereas the absolute insulation of A is 39,686 or 8,889,664 per mile, and of B 43,474 or 9,739,296 per mile. It must be understood that these formulas will only hold good when the insulation of the line is uniform throughout, a condition which is rarely found in this country. Some desultory sections of line may stand very high in insulation, but a defective insulator here and there reduces the whole to nearly their own level; they being the "black sheep that spoil the flock." In order to insulate a line uniformly, it is necessary to fix upon a standard, and have each insulator individually measured before putting up. Another thing that must not be overlooked by the electrical student, is the fact that the same measures cannot be obtained by testing first with one and then with the other pole of the same battery, and, consequently, those tests made with but one pole of a battery must differ widely from the correct figures. It has been suggested that this variation is due to the leakage into the wire tested of foreign currents which aid or oppose the testing current, at one time neutralizing, at another assisting to deflect the needle. Theories are advanced that the difference arises from polarization of ground plates, and of chemical action in the testing battery. It occurred to the writer that some of the variation may be due to electrolysis at the points of contact between the wire and insulators, hydrogen or oxygen gas being separated from any moisture that might be present. Whatever may be the cause, the facts remain, and perhaps some light will be speedily thrown on the subject. It is suggested by some electricians to take a measure, with each pole to line in succession, and adopt the mean as the correct measure. This is well enough where measures so taken do not widely differ, but where they do it is claimed this procedure is incorrect. The writer has taken measures of an artificial circuit on which leaks of current were introduced, and the mean between the measures obtained with positive and negative currents could not be made to agree with the resistance measured. Schwendler gives the following formula for estimating true resistance measured by Wheatstone's Balance with

positive and negative currents. a and b are the two branch resistances; W' the adjusted resistance with +; W'' that with — current towards a and b ; the battery resistance may be neglected. The required resistance becomes

$$x = \frac{b}{a} \frac{W' + W''}{2} - \frac{(W'' - W')^2}{2(W' + W'') + 4a}$$

Call a 500, b 500, W' 1000, W'' 1200, then

$$\frac{1000 + 1200}{2} = 1100, \text{ and}$$

$$\frac{(1200 - 1000)^2}{2(1000 + 1200) + 4a} = 6$$

$1100 - 6 = 1094$, the true resistance.

In the last JOURNAL Mr. Brown has given some very clear ideas of the use of the Tangent Galvanometer, but he uses and defines the term "farad" differently from any authority I possess on the subject, and it is well in the outset to have the matter investigated and cleared up to prevent misconception. The term farad has been generally used to express capacity. Clark and Sabine describe it as follows: "The BA unit of capacity is called a farad. The capacity of any electrified body is that quantity of electricity which it contains when the inductive surfaces have a difference of potential of one volt.

On page 248 of Culley we find "the unit of capacity is called a farad, and is, according to Clark, that quantity of electricity which, with an electromotive force of about one volt (about 1 Daniell cell) would flow through a resistance of one megohm in one second." Therefore we say a wire or a condenser has so many farads capacity. The quantity of current flowing through a circuit is expressed by Vebers, and is defined by Clark as "that quantity of electricity which flows through a circuit having an electromotive force of one volt, and a resistance of one ohm in one second."

F. W. J.

CHICAGO, May 12, 1874.

MARIETTA, Ohio, May 21, 1874.

To the Editor of the Journal of the Telegraph:

In your issue of May 1st you publish a letter from a correspondent at Louisville, wherein he asks for information as to the proper resistance for sounders to be used on a line 2,760 feet in length.

We take this occasion to offer to your correspondent, and to your readers generally, a description of a line now in operation in this city, which we think is the best working, and, perhaps, the longest line of its kind and purpose for which it is used, in the country, having for its object the furnishing of the means for telegraphic communication between several families and friends residing in different parts of the city of Marietta and the adjoining town of Harmar, constructed entirely for the amusement and entertainment of those who have had no practical experience in telegraphy other than that afforded them by the use of this line. We are, therefore—if we may, by virtue of our limited telegraphic experience, be permitted to use the telegrapher's slang—truly "a set of plugs."

The line, which has been in operation about five months, is nearly four miles in length, with ground connections at either end. Starting from a farm house one mile outside of the city limits, it runs through the city, crossing the Muskingum river into Harmar. There are fourteen offices on the line, using sounders of 20 ohms resistance each, working finely with twelve cups of battery, part of which is Daniell's and part Callaud.

We have experimented with several kinds and make of sounders, and find that those made by one

of the leading advertisers in the JOURNAL, with twenty ohms resistance, are best adapted to the service, being light in construction, with a good helix, give a clear and distinct sound, and are, withal, very handsome instruments. The ladies have them in their parlors mounted, with the keys, on handsomely carved bases, taking a great deal of pride in exhibiting them to their visitors, and sending telegrams to distant portions of the city for their amusement.

The line connects with nine residences, railroad depot, telegraph office, book store, jewelry store and post-office, affording the owners an opportunity of doing a great variety of business without being compelled to leave their homes for that purpose.

Although glad of an opportunity of giving this description of the Marietta and Harmar Telegraph Line, the object of our letter is to suggest to our Louisville friend the use, for his short line, of a sounder of a higher resistance than that recommended by the Editor of the JOURNAL. The instruments in use here will work well on a line of 2,760 feet in length and six instruments in circuit, with four cups of gravity battery.

G. B. D.

CHICAGO, May 9th, 1874.

To the Editor of the Journal of the Telegraph:

In reply to the inquiry in last JOURNAL from O. B. Wood, Manager of Albion, Mich., office, I would say that we have answered five paid inquiries from Albion, Mich., in the last sixteen months, and in only one of these have we overchecked that office on messages dated the last day of the month, by entering on 1st day of succeeding month. This was done in December, '73. In that month we checked him on one message dated November 29th.

The message was received here after 8 A. M., Dec. 1st. Before that hour we had gathered up all the business of 29th and 30th; the drawers and press copy files were empty, and the fact could not be known to me.

Have not received any free inquiries from Albion, Mich., in last sixteen months.

GEO. B. SIMPSON, Book-keeper.

MARTELL, Iowa, April 27, 1874.

To the Editor of the Journal of the Telegraph:

I find by taking a common sewing needle and suspending it in front of the relay in a position so that it cannot touch the magnet, it will show at all times, and in all kinds of weather, whether the line is working or not. It is very cheap, much cheaper than a pocket compass.

G. S. BUCK, Operator.

To the Editor of the Journal of the Telegraph:

In next issue of JOURNAL please give the system of finding the locality of a cross or ground on a wire. Please explain fully, and give us an idea of testing wires?

"73."

Answer.—Crosses and grounds are located in various ways. Where two wires are crossed with little or no resistance at the point of contact, the distance of the cross from the testing station may be found by direct measurement of the resistance of the wires forming a loop through the cross, the wire resistance per mile being previously known. A "dead" ground may be located in the same way. When the resistance at the cross or point of escape is considerable, other methods are necessary, a full explanation of which would require too much space for this column. At a future time we will go into the subject in detail.

FOREIGN ITEMS.

TELEGRAPH CONSTRUCTION AND MAINTENANCE COMPANY.—These shares have remained firm, notwithstanding the depression in the telegraph market. The vessels despatched to pick up the Lisbon and Madeira section of the Brazilian lines are now on the spot, but as the advices from Lisbon report a change in the wind it is just possible we may not hear of the completion of the work for another week. In the delicate operation of picking up cables, fair weather is an all-important element to success. The expedition to complete the Brazil section from St. Vincent to Pernambuco sails next week, under the command of Captain Halpin, and on the return to England of this experienced commander he will undertake the charge of the "Great Eastern," to lay the new cable for the Anglo-American Company from Ireland to Newfoundland. The repair of the 1866 cable was to be effected about the middle of May, when it was expected the weather off the coast would moderate.

On Saturday, the 2d ult., the cable steamship "Hooper" left Gravesend with the cables of the Central American Telegraph Company, manufactured by Hooper's Telegraph Works, to be laid between Para, Cayenne, and Georgetown, Demerara. When laid, these cables will connect the united systems of the Plato-Brazileira, Western and Brazilian, and West India and Panama Telegraph Companies, and will complete the chain of electric communications between the River Plate and the United States of America. The total weight of the cables now shipped on board the steamship "Hooper" amounts to upwards of 3,900 tons, being the greatest weight of submarine telegraph cable taken on board any vessel at one time.

TELEGRAPHIC advices were received on Thursday, the 7th ult., from Rio de Janeiro, under date 18th April, with reference to the telegraphic cables of the River Plate and Brazil Telegraph Company, which were in process of being submerged by the contractors, Messrs. Siemens Brothers, under the superintendence of the engineers of the Company, Sir Wm. Thomson and Professor Fleeming Jenkin. It appears that the first portion of the cable taken out by the steamer "Ambassador" had been successfully laid from Rio to Santos and Santa Catharina, and the steamer had returned to Rio. The remaining portion, taken out from England by the steamer "Gomos" (which had arrived safely), was to leave by that steamer on 21st April, to be laid from Santa Catharina to Rio Grande do Sul, and thence to be joined to the cables to Montevideo, which have been already submerged. From this it would appear that the completion of this important telegraphic line of communication may be looked for at any moment.

THE steamship Faraday, with the new Atlantic Telegraph cable on board, which sailed from England on the 17th, is expected off the coast of Nova Scotia in a few days. The cable will be landed at Berry Head, Parr Bay, in Guysboro' County, distant from Halifax 100 miles. After landing the cable at Parr Bay, the Faraday will proceed to Rye Beach, N. H. Mr. Oliphant, one of the members of the new Cable Company, has arrived at Halifax.

THE total traffic receipts of the Great Northern Telegraph Company have been, during April, 1874, 354,815 francs, and in corresponding period of 1873, 241,351 francs. Total, 1874, 1st January to 30th April, 1,332,331 francs; corresponding period in 1873, 855,888 francs.

THE traffic receipts of the Eastern Extension, Australasia, and China Telegraph Company, for the month of April, 1874, amounted to £16,670, and to £18,393 for the corresponding period of 1873.

The Eastern Telegraph Company's traffic receipts for the month of April, 1874, amounted to £30,766, and to £30,893 in the corresponding period of 1873.

THE receipts of the Submarine Telegraph Company for the month of April, 1874, amounted to £8,010 8s. 2d. For the corresponding month of the preceding year they were £8,093 12s. 11d.

THE number of messages (of twenty words) passing over the line of the Barcelona-Marseilles Cable for the month ending April 30, 1873, was 4,064.

The tenth ordinary meeting of the Shareholders of Reuter's Telegram Company was to be held on Wednesday, 20th ult., at the Company's offices, 24, Old Jewry, for the reception of a report and balance sheet from the Directors, the declaration of a dividend, and the election of a Director and Auditors.

THE Eastern Telegraph Company announces the opening for traffic of its new cable between Italy and Egypt via Zante and Candia. This Company has now three cables working efficiently between Europe and Egypt, which is thus placed in direct submarine telegraphic communication with Great Britain, Spain, Portugal, Gibraltar, France, Malta, Italy, Greece, and Turkey.

THE German Union Telegraph Company have declared a dividend for the year 1873 of £1 1s. 2d. per share of £15.

THE Hamburg-Heligoland Telegraph Company have declared a dividend at the rate of 8s. 11d. per share of 100 thalers, or £15.

MESSRS. C. J. Hambro and Son have announced the payment of the excess dividend on the Great Northern Telegraph Shares, at the rate of 1s. 8d. per share, on presentation of coupon No. 1 for 1872, and No. 2 for 1873.

MESSRS. Grant Brothers and Co. have announced that the half-yearly coupon, due the 1st of May, on the Seven per cent. First Mortgage Building Bonds of the Western Union Telegraph Company will be cashed at the fixed exchange of 4s. per dollar, equal to £7 per coupon.

THE following statement shows the total number of messages forwarded from postal telegraph stations in the United Kingdom during the week ended the 9th of May, 1874, and during the corresponding week of 1873:—Week ended May 9th, 1874, 375,870; week ended May 10, 1873, 329,382; increase in the week of 1874 on that of 1873, 46,488.

THE MAGNETIZATION OF GLASS.—An interesting paper in Poggendorf's *Annalen*, by Prof. Villari, treats of the time that flint glass takes to be magnetized, demagnetized, and to turn the plane of polarization. He rotated a glass cylinder between the poles of an electro-magnet, where it acted like a cylindrical lens with polarized light passing through the poles. When not magnetized, the cylinder, whether in motion or at rest, was neutral to the light; but when magnetized its plane rotating power diminished considerably, with increasing velocity of rotation; the reason being that, in such quick revolution, each diameter remained too short a time in the axial direction to require all the magnetism it would otherwise have. To give flint glass such dia-magnetic intensity as became observable by rotation of the plane, required at least $\frac{1}{100}$ of a second of time, while to give it all the dia-magnetism it is capable of taking under a strong magnet, at least $\frac{1}{100}$ of a second was needed.

LIGHTNING IN THE WEST.

The prevalence of lightning west of the Mississippi render special precautions necessary to prevent injury to property. We take the following from a circular issued by Supt. Clowry of St. Louis to his district, which, we are inclined to think, might, with advantage, be adopted more extensively. A lightning conductor on an office pole seems a necessity everywhere.

LIGHTNING CONDUCTORS.

"Lightning conductors of ordinary line wire will be placed upon every fifth pole on new lines when being constructed. About ten feet of this wire should be formed into a flat coil, and placed under the butt end of the pole, the other end of the wire to be stretched up the side of the pole and fastened to the same by ten or more wire staples, and, if a bracket line, extended about three inches above the top of the pole; if a ring and pin line, the ground wire should be wrapped closely once around the pole three inches below the ring, and securely fastened with the staples. On bracket lines the ground wire should be attached to the pole, one-quarter of the way around from the bracket, so that if a second wire is put up on the opposite side, neither of the line wires can touch the ground wire if detached from the brackets. On cross arm lines the ground wire should be attached to the pole on the opposite side to the cross arm.

"Lightning conductors should be attached to all office poles, and when they are placed upon poles already standing, the above directions should be followed as nearly as possible, the coil of wire being placed at least three feet beneath the surface of the ground."

We add the following from a letter recently received from Mr. Clowry, not designed for publication, and, indeed, not addressed to us, but which we take the liberty to use:

"It would be impossible for me to calculate the benefit of lightning conductors on poles in the West. Every lightning storm shattered and destroyed our poles on the prairies and plains before we used them. Now they are fully protected by a conductor on every fifth pole, and I am not certain but a rod on every tenth pole would answer the purpose on many lines. I have tried the latter plan on our Kansas line and it works well.

"On lines much exposed to lightning I have placed conductors on each office pole, as per enclosed photograph, a copy of which is distributed to line repairers, stiff No. 8 wire being used, the end of which is about an inch from the end of a double tie wire. The points cannot get any closer together, and care should be taken to attach the lightning conductor on the opposite side of the pole from the cross arm. Previous to the adoption of this plan a number of office buildings, with lightning arresters inside, were burnt down by lightning, and we were constantly troubled by the lightning coming inside, but we have no such trouble now. Poles with lightning conductors should be kept free of snow.

"The enclosed is the best plan I have seen, and was arranged by Mr. D. H. Fitch of Moberly, Mo.

"I find it of the greatest importance to have a uniform system for running office wires, and to hold strictly to it. It seems objectionable to extend office wires outside of buildings even when soldered to the iron main wire; local action soon takes place, in moisture, between the two metals, the copper wire eats off, and the repairer is very apt to splice them without soldering."

TARIFF BUREAU.

SEMI-MONTHLY CIRCULAR.

EXECUTIVE OFFICE,
WESTERN UNION TELEGRAPH COMPANY,
145 BROADWAY, NEW YORK,
June 1, 1874.

To all Offices on W. U. Lines:

The following changes and additions have been made since the date of the last circular:

GENERAL INFORMATION.

Notasulga, Ala., reopened.
Wilsonville, Ala., closed.
Delano, Cal., closed.
National City, Cal., closed. Business now delivered from San Diego. charges for delivery 50 cents.
Laurel, Del., reopened.
Palmetto, Ga., reopened.
Business for Cannelton, Ind., will hereafter be sent only via Evansville, Ind.
Blandville, Ky., closed.
Business for Oxford, Md., will hereafter be mailed at Easton, Md.
Business for Mackinaw Island should be sent and checked to Point St. Ignace, Mich.
Half rate messages should not be taken for or received from Point St. Ignace and Carp River, Mich.
Saline, Mich., reopened.
Bedford, Mo., closed.
Cunningham, Mo., closed.
Business for No. Mo. Junc. and Minerville, Mo., should be sent and checked to Harlem, Mo.
Leed's Point, N. J., closed.
The P. O. address of Seaville, N. J., is South Seaville, N. J.
Business for Lafayette, Hudson City, and Bergen, N. J., should be checked to Jersey City, N. J.
Business for Portville, N. Y., should be sent and checked only to Buffalo, N. Y.
Lakeview, N. Y., square 180, is in Erie County.
Waterville, N. S., reopened.
Green Springs, Ohio, reopened.
Grand Tunnel, Pa., closed.
E. Nanticoke, Pa., closed.
Meyers Mills changed to Myersdale, Pa.
Pit Hole, Pa., reopened.
Fort's Station, Tenn., closed.
Mesquez, Tex., closed.
Clarendon Springs, Vt., reopened.

NEW OFFICES.

294 Helena, Ala.
Biggs Station, Cal.
* Indian Wells, Cal. 100 8 San Diego.
* Mountain House, Cal. 130 110 Colusa.
* Munchville, Cal. 60 125 "
* Spadra, " 80 110 Los Angeles.
* Turners, " 50 125 Colusa.

† Each additional 5 or fraction of 5 words.

237 Butler, Ga.
308 Burr Oak, Ill.
317 Cornell, Ill.
358 Perry Springs, Ill.
318 Sullivan, Ill.
323 Shumway, Ill.
280 Union Mills, Ind.
447 Gardner, Ks.
339 Ft. Jefferson, Ky.
* Willard, Ky., 25 2 Riverton, Ky.
60 Federalsburg, Md.
108 Mechanicsburg, Md.
108 Smithsburg, Md.
103 Williamsport, Md.
19 Point St. Ignace, Mich.
179 Sand Beach, Mich.
4 Berton, N. B.
4 Carleton, N. B.
4 Salamanca, N. B.
180 Lakeview, Chautauqua Co., N. Y.
74 Manlius Village, N. Y.
45 Round Lake, N. Y.
* Chestnut Hill, Pa., 25 2 Philadelphia.
122 Myersdale, Pa., (formerly Meyer's Mills).
380 Adams, Tenn.

ATLANTIC CABLE BUSINESS.

We are notified that except in messages sent "via Teheran,"

"via Falmouth," or "via Santander," the words indicating route, as "via VOLO," will hereafter be charged for throughout. No change has been made in the charge for messages "via Teheran, Falmouth, or Santander.

WILLIAM ORTON, President.

TRANSFER SERVICE.

EXECUTIVE OFFICE,
NEW YORK, May 22d, 1874.

To "Special Transfer" Offices:

Hereafter all Special Transfers must be paid by check to the order of the payee, and no such check will be cashed at the Company's office except upon the positive identification of the payee thereof.

GEO. H. MUMFORD,
Vice-President.

A MEETING of the Board of Directors of the Pacific and Atlantic Telegraph Company was held on May 15th, at the principal office of the Western Union Telegraph Company in Philadelphia, at which George H. Mumford was elected President, and R. H. Rochester Secretary and Treasurer. A resolution was adopted confirming and ratifying a lease dated Dec. 16, 1873, under which the Western Union Company took charge of the lines and offices of the Pacific and Atlantic Company.

ESTIMATES of the total population of the globe, made during the last twenty years, have varied all the way from eight hundred millions to twelve hundred millions, but the latest compilations, we believe, are forcing the census-takers to the conclusion that even the largest of these aggregates is too small. A series of papers recently published on the subject by the German savans, Behm and Wagner, concludes with the following table of the estimated population of the grand divisions, which will be of interest to our readers:

Europe.....	800,580,000
Asia.....	798,220,000
Africa.....	208,300,000
America.....	84,542,000
Australia and Polynesia.....	4,438,000
Total.....	1,391,080,000

BORN.

HARRIS.—At Warsaw, Ill., April 27, 1874, to J. G. Harris, Manager W. U. Tel. office, a daughter.

WILDRICK.—At Freemansburg, Pa., May 12, 1874, to F. H. Wildrick, agent and operator, a son.

MARRIED.

BOOTH—RAYMON.—At the residence of the bride's parents in Crawford Co., Ohio, M. P. L. Booth, Train Dispatcher A. & G. W. R'y, Gallon, O., to Miss Mina A. Raymond. No cards.

LAWRENCE—KIRBY.—At Dayton, O., May 13, 1874, by Rev. Mr. Weddell, Horace W. Lawrence, operator C. H. and D. R'y, to Miss Mary Kirby, all of Dayton.

REICHELDERFER—SANFORD.—At the residence of the bride's parents, May 30th, 1874, A. C. Reichelderfer, to Miss Nickie Sanford, both of Lima, O.

RUTENBECK—LONGMUIR.—At Fort Union, N. M., May 13th, 1874, by Rev. D. W. Eakins, Theo. Ruttenbeck, Manager W. U. Tel. office, Las Vegas, N. M., to Miss Mary N. Longmuir of Fort Union. No cards.

DIED.

FISHER.—At Salem, W. Va., April 26th, 1874, Bella L., wife of R. D. Fisher, Manager W. U. Tel. office, aged 29 years 7 months and 27 days.

LONG.—At Chicago, May 1, 1874, Minnie, infant daughter of W. C. Long, of the Western Union Telegraph office, aged 8 days. "Rosebuds just opening are often ruthlessly plucked."

PRIEST.—At Detroit, Mich., May 9th, 1874, Thurlow W. Priest, for several years chief operator W. U. Tel. office, Detroit. His remains were taken to Little Falls, N. Y., for interment.

THE TELEGRAPHERS' MUTUAL BENEFIT ASSOCIATION.

ASSESSMENT No. 62, ISSUED MAY 15, 1874.

DEATH OF EDWARD P. REARDON.

Edward P. Reardon of Yonkers, N. Y., (certificate No. 798, issued March 21st, 1870,) died April 27th, 1874, of paralysis.

Mr. Reardon allowed himself to become delinquent, but was restored to membership while in health, under the amnesty resolution passed at the last annual meeting.

Members holding certificates numbered up to and including No. 2,231 are called upon to remit for above assessment.

ACKNOWLEDGMENT OF RECEIPTS FOR ASSESSMENT NO. 61, UP TO AND INCLUDING MAY 25.

13, 15, 17, 23, 25, 28, 37, 58, 60, 65, 67, 70, 72, 75, 80, 89, 97, 99, 101, 103, 108, 114, 120, 129, 140, 146, 171, 179, 183, 189, 190, 191, 193, 197, 198, 215, 218, 227, 240, 243, 267, 274, 278, 279, 281, 282, 283, 285, 286, 301, 342, 353, 367, 373, 378, 380, 391, 392, 398, 408, 405, 413, 438, 456, 476, 481, 484, 510, 511, 512, 520, 527, 533, 542, 553, 554, 569, 573, 574, 575, 586, 587, 649, 656, 662, 663, 664, 665, 669, 672, 678, 680, 685, 706, 714, 735, 730, 733, 734, 737, 764, 773, 808, 813, 820, 848, 858, 869, 870, 875, 876, 883, 899, 901, 905, 908, 911, 912, 923, 927, 938, 939, 942, 943, 976, 977, 991, 992, 1001, 1006, 1011, 1028, 1058, 1069, 1074, 1075, 1076, 1093, 1098, 1100, 1101, 1103, 1103, 1127, 1149, 1164, 1196, 1206, 1208, 1217, 1227, 1233, 1237, 1258, 1240, 1241, 1243, 1270, 1277, 1283, 1288, 1294, 1307, 1308, 1309, 1311, 1312, 1313, 1314, 1315, 1317, 1318, 1319, 1320, 1321, 1322, 1345, 1353, 1354, 1355, 1356, 1358, 1372, 1375, 1376, 1385, 1389, 1390, 1391, 1398, 1407, 1417, 1418, 1425, 1428, 1437, 1438, 1448, 1451, 1453, 1454, 1455, 1456, 1482, 1483, 1498, 1500, 1501, 1505, 1506, 1507, 1508, 1515, 1516, 1534, 1531, 1546, 1554, 1559, 1563, 1563, 1564, 1572, 1580, 1589, 1591, 1610, 1611, 1612, 1623, 1625, 1626, 1630, 1631, 1633, 1634, 1646, 1650, 1652, 1656, 1660, 1661, 1662, 1663, 1665, 1676, 1681, 1682, 1714, 1733, 1738, 1773, 1775, 1794, 1795, 1796, 1797, 1802, 1804, 1815, 1818, 1823, 1824, 1844, 1845, 1854, 1863, 1881, 1900, 1901, 1906, 1916, 1917, 1921, 1942, 1957, 1970, 1972, 1991, 1995, 1999, 2000, 2001, 2004, 2016, 2021, 2027, 2048, 2060, 2061, 2065, 2072, 2079, 2083, 2064, 2065, 2068, 2108, 2112, 2114, 2116, 2119, 2120, 2123, 2125, 2127, 2131, 2136, 2137, 2143, 2143, 2154, 2159, 2166, 2167, 2169, 2179, 2180, 2189, 2193, 2202, 2203, 2204, 2205, 2206, 2207, 2208, 2209, 2210, 2211, 2212, 2213, 2214, 2215, 2216, 2217, 2218, 2219, 2220, 2221.

ACKNOWLEDGEMENT OF RECEIPTS FOR ASSESSMENT NO. 62, UP TO AND INCLUDING MAY 25, 1874.

15, 16, 17, 21, 23, 28, 37, 46, 52, 54, 58, 60, 64, 65, 74, 75, 77, 86, 88, 103, 113, 120, 123, 129, 131, 145, 148, 157, 179, 203, 215, 217, 228, 248, 267, 269, 274, 277, 278, 279, 281, 282, 283, 285, 286, 289, 301, 342, 349, 351, 353, 360, 372, 378, 388, 385, 391, 394, 405, 413, 416, 436, 464, 467, 478, 509, 510, 520, 536, 532, 533, 536, 542, 546, 547, 549, 553, 564, 576, 579, 587, 615, 618, 626, 649, 656, 672, 678, 680, 685, 708, 721, 731, 734, 737, 740, 764, 769, 791, 799, 813, 821, 825, 832, 858, 875, 913, 915, 917, 941, 976, 977, 991, 992, 1001, 1005, 1011, 1013, 1028, 1039, 1054, 1061, 1063, 1090, 1098, 1126, 1127, 1147, 1148, 1167, 1178, 1183, 1195, 1199, 1202, 1208, 1210, 1232, 1260, 1268, 1267, 1274, 1276, 1300, 1306, 1345, 1357, 1358, 1368, 1394, 1402, 1403, 1404, 1407, 1410, 1425, 1444, 1451, 1453, 1454, 1455, 1456, 1482, 1484, 1489, 1506, 1507, 1511, 1516, 1524, 1527, 1537, 1550, 1554, 1562, 1564, 1571, 1579, 1589, 1590, 1615, 1623, 1625, 1630, 1632, 1634, 1673, 1708, 1723, 1735, 1736, 1818, 1862, 1894, 1900, 1901, 1919, 1944, 1950, 1973, 1999, 2000, 2001, 2019, 2028, 2030, 2048, 2049, 2063, 2063, 2101, 2108, 2116, 2129, 2138, 2135, 2137, 2143, 2154, 2168, 2169, 2173, 2174, 2187, 2190, 2199, 2201, 2204, 2211, 2212, 2213, 2218, 2219, 2220, 2221, 2222, 2228, 2229, 2230, 2231, 2232, 2233, 2234, 2235, 2236, 2237, 2238, 2239, 2240, 2241, 2242, 2243, 2244, 2245, 2246, 2247, 2248, 2249, 2250.

ACKNOWLEDGMENT OF RECEIPTS FOR ASSESSMENTS NOS. 58, 59 AND 60 UP TO AND INCLUDING MAY 25, 1874.

15, 22, 27, 232, 237, 238, 242, 246, 258, 273, 294, 347, 398, 451, 453, 455, 457, 542, 570, 602, 766, 804, 880, 913, 1067, 1130, 1134, 1135, 1136, 1153, 1240, 1257, 1425, 1450, 1531, 1563, 1636, 1631, 1646, 1715, 1716, 1723, 1731, 1745, 1773, 1786, 1939, 1941, 1974, 1975, 1976, 2037, 2061, 2063, 2064, 2066, 2127, 2163, 2169, 2177, 2182.

MISCELLANEOUS.

58.—1409, 2029.

59.—2029.

ALL telegraph operators engaging with the Grand Trunk Railway are required to sign a pledge of total abstinence from all intoxicating liquors. This pledge is required of all other operators of that road as well.

ON THE PRINCIPLE OF VOLTA.

By PROF. RIGHI.

Putting aside the theory of the pile, and without prejudging it, I have proposed to demonstrate the real existence of the electromotive force of contact, independently of all chemical action of the surrounding medium.

Volta made two fundamental experiments:—1. The experiment with the two plates, zinc and copper; it is explained by chemical action of the liquids moistening the fingers, that is to say, it comes quite naturally into the theory of the pile; 2. The experiment with the insulated zinc plate, placed on the condenser; the chemical action which is here adduced in explanation by M. de la Rive is the action of the surrounding medium. It should be noted that in the former experiment the zinc is charged negatively, and in the second positively. I am in a position to prove—1. That the explanation given by M. de la Rive is inadmissible; and 2. That very distinct signs of electricity are obtained even when the zinc is covered with an insulating layer several millimetres thick.

The apparatus employed in these researches was the induction electrometer. It consists of two brass pulleys, one above another, on a stand, with a caoutchouc tube, which bears 200 small brass rings 5½ m.m. diameter, formed of 1 m.m. wire, passing round them. The caoutchouc tube (half a metre long) is put in motion by the lower and larger pulley (call it B), which receives its motion from a side pulley wrought by the hand. A body, E, (electrified) is held by a support very near the upper and smaller pulley, A, where the rings leave this and go to B. The rings thus move down charged with electricity of contrary sign to that of the electrified body, and they carry it to a conductor, C, which is connected with a very sensitive dry pile electroscope. This conductor is spherical, and has two holes through which the rings pass; that by which they enter is no more than wide enough to let them pass, the other is much wider, nearly 12 m.m. diameter. In this conductor there is a small brass pulley which the rings touch in passing, and thus communicate their electricity to the conductor. As a contact is thus effected at a point of the conductor where the electric density is *nil*, the rings leave it discharged. However small the charge of the body E (placed near the upper pulley), the charge of the spherical conductor increases rapidly, and becomes sufficient to be indicated by the electroscope. It is necessary that the rings and the pulleys be of the same substance, otherwise there is always a small development of electricity even when no electrified body is brought near to the upper pulley.

The explanation of M. de la Rive, by which that eminent physicist brings the development of electricity in Volta's second experiment into the theory of the pile, is well known. "This disc (of insulated zinc) polarizes the molecules of the layer of moisture in contact with the surface as a plate of zinc polarizes the molecules or water in which it is immersed. The moment that the zinc is brought into contact with the copper disc of the condenser, a couple is formed, a discharge occurs, the negative electricity passes from the zinc to the copper in contact, the zinc is oxidized and the positive electricity become free, being unable to flow away (since the medium where it is liberated, instead of being, as in the case of a true voltaic couple, liquid and conducting, is gaseous and insulating), remains at the surface of the zinc, where it is condensed by the negative which has

passed into the copper disc." According to M. de la Rive, the copper receives its negative electricity from the zinc, and not from the air; if, then, the copper be covered with gum lac, the same results should be obtained. Now, take a disc of copper 15 centimetres diameter, and on one of its faces, near the edge, solder three zinc wires 3 or 4 m.m. long, cover the copper disc with melted gum lac in such a way that the ends of the three wires are left bare; then put it in contact with a disc of zinc by means of these three wires. If there is a difference of potential between the two metals, they should take opposite charges, which are smaller the further the discs are separate. On bringing the two discs successively (by means of insulating handles) to the electrometer, it is found that they have nearly the same charges as are obtained if the copper is not covered with gum lac.

It is thus indeed true that the copper does not receive its charge from the air. For those who do not accept the theory of contact, it follows that the disc of copper might be replaced by a disc of zinc covered with gum lac. Indeed, according to them, wherein can the zinc covered with resin differ, in this experiment, from an unoxidizable metal? Very well; if the experiment be repeated with two discs, one of zinc in the ordinary state, the other of zinc covered with gum lac, not the least charge will ever be obtained. On the other hand, one might repeat, word for word, the explanation of M. de la Rive, substituting for the word *copper*, the words *covered zinc*.

In place of coating the metallic discs with resin, they may be immersed in an insulating liquid which has no chemical action on the metal, in such a way that the three small ends of wire of the same nature with the metal with which the immersed disc is put in communication, are a little above the surface of the liquid. The effects are not changed, though the liquids may be in many various ways.

In this same theory of M. de la Rive, one might substitute for copper some metal less attackable than zinc, *e. g.*, aluminium. If the experiment be made, the aluminium will be found positive, and the zinc negative; that is to say, that the aluminium behaves as though it were more oxidizable than the zinc; while, on the contrary, it is ascertained that the same discs immersed in water give a current of the same direction, which would be observed if copper were in place of the aluminium.

From these experiments it follows that M. de la Rive's explanation must be rejected.

The existence of the electromotive force of contact being demonstrated, substances may be ranged in such an order that each one is positive with those which follow; we have thus the following list: Aluminium, zinc, lead, tin, iron, copper, anthracite, silver, pyrites, platinum, gold, battery-charcoal.

Thus, for example, if we place a disc of copper on a disc of charcoal, and afterwards separate them, the copper is found positive and the charcoal negative.

I commence to study the existence of the electromotive force of contact between two bodies of the same nature, but with different temperature; the warm substance is charged negatively. I reserve these facts for another occasion. There is nothing to hinder our supposing that the cause of electricity, of friction, of cleavage, of pressure, &c., is always the force of contact. I may recall, among others, the experiments of M. Gauguin, who has classed the metals according to the sign of electricity they acquire by friction; the list of the French physicist coincides with mine, and, notably, aluminium in it precedes zinc. I may also trace a connection between the well-known fact of the tendency to be electrified

negatively, which heat communicates to bodies, and the fact which I have pointed out, of a difference of potential produced by an elevation of temperature.

In this extract I have omitted all details of experiments required to guard against the numerous causes of error naturally presenting themselves in researches so delicate.

ON THE NEW CONTACT THEORY OF THE GALVANIC CELL.

At the Physical Society, on the 21st March, Mr. J. H. Fleming introduced a paper on the above subject, in which he discussed the various opinions respecting the contact and chemical theories. Afterwards Mr. Fleming showed his new battery, in which the metallic contact of dissimilar metals is entirely avoided. The arrangement consists of thirty-six test tubes of dilute nitric acid, and the same number of tubes of sodium pentasulphide, all well insulated, alternating with one another. But strips of alternate lead and copper connect the neighboring tubes; by which means the terminals are of similar metal, and a current of sufficient intensity to violently affect a quantity galvanometer obtained. The potential increases, as in the ordinary galvanic arrangement, with the number of cells employed, until sixty cells showed an electromotive force exceeding that of the same number of Daniell's elements. In this new battery the acid lead is positive to copper; whilst in the sulphide it is negative. Mr. Fleming further showed how, by using the single fluid nitric acid, and the single metal iron, a similar battery could be constructed, provided one-half of each iron strip was rendered passive. This is an important discovery; for it seems to revive the theory that chemical action is not necessary in a galvanic apparatus to produce electricity. At all events it is of sufficient interest to merit the sound inquiry into its principles which physicists seem likely to make.

THE RELATIONSHIP BETWEEN ELECTRICITY, HEAT, AND MOLECULAR FORCES.—Professor Barrett of Dublin calls attention to certain remarkable molecular changes occurring in iron wire at a low red heat. Mr. Gore, in 1869, published the important fact that when an iron wire is heated to bright incandescence, and then allowed to cool, a momentary elongation occurs just after it has begun to contract by cooling. Mr. Barrett having undertaken further to investigate this subject, finds that during the preliminary heating of the wire a slight and momentary retrogression in the otherwise regular expansion was noticed at a temperature corresponding to the powerful jerk that occurred on cooling; and, again, it was evident that the anomalous deportment of the iron occurred at approximately the same temperature at which iron undergoes magnetic change. All kinds of iron do not exhibit this behavior, some showing it in a more or less marked degree. Barrett was not able to detect any change in heating or cooling in certain specimens of good, soft iron wire, but in hard iron wire, and notably in steel wire, it is very apparent.

THE *Journal Officiel de la Republique Francaise* of April quotes from the *Economiste a resume*, which gives in figures the degree of activity of the electric correspondence in different nations for 1871:—France, 7,447,000; England, 12 million (not including 700,000 telegrams for the exclusive use of the Press); United States, 12,404,000; Italy, 2,588,000; Switzerland, 1,517,000, not reckoning 109,000 dispatches in transit and 85,000 service dispatches; Germany, 7,108,000; Austria, 3,974,000; Belgium, 2,880,000; Holland, 2,050,000.

Journal of the Telegraph.

This Journal is issued on the 1st and 15th of each month. Its circulation is over 8,000. It goes to every State, Territory and Province on the Continent. It has become a necessity, and is always welcomed as a friend. No better medium for advertising exists.

TERMS:

TWO DOLLARS PER ANNUM IN ADVANCE.

Address—

JOURNAL OF THE TELEGRAPH,

Western Union Telegraph Company,

145 Broadway, New York.

NEW YORK, JUNE 1, 1874.

THE semi-annual meeting of the Directors of the Western Union Company will be held at the Executive offices of the Company, in this city, on Wednesday, June 8d.

There are many rumors afloat respecting a prospective dividend to be declared upon the stock of the Company. As yet no action has been had, but the condition of the affairs of the Company is such as to warrant a favorable consideration of the subject.

PRESIDENT ORTON arrived home on Sunday evening, May 24th, on the steamship *Oceanic*, much improved in health from his brief trip to Europe.

THE House Committee on Foreign Affairs have agreed to report a bill relating to telegraphic communication between the United States and foreign countries. It is general in its character, and authorizes the Secretary of State to grant permission to lay cables to any citizen or association on the conditions stated in the bill.

A BILL was introduced in the Senate on Monday, May 18th, by Mr. Frelinghuysen of New Jersey, which proposes to give to Celso Caesar Moreno, William B. Phillips, and Henry Creilly of New York, and J. B. Haggin, Lloyd Tevis, Thomas H. Selby, James Otis, N. W. Spaulding, Henry Durant, Eugene L. Sullivan, Philip A. Roach, Samuel Butterworth, John B. Felton, and O. H. La Grange of California the right to construct and maintain a line or lines of telegraph cable, to connect the American and Asiatic coasts, on condition that the work of laying the cable shall be begun within three years from the enactment of the bill. The bill also provides that the Secretary of the Navy shall be authorized to detail one or more steam vessels to be at the disposal of said Company to assist in the surveys, in laying and submerging the cable, transporting materials, and generally to afford any assistance calculated to promote the success of the enterprise.

ROTATION.

Under this caption, an otherwise intelligent man sends us an article which we cannot publish, because it is both very unsound and very thin. Very few dogs will shake a rat after he has killed it, but some men, like our correspondent, are not content with spearing their enemy, but must keep kicking the fallen foe until the killing, however cleverly done, looks like murder. This is just what our correspondent has done, and so we shut him out. We shall, however, state his case fairly.

In the City of New York, as is well known, the Western Union Co. have a large number of offices, with one which is known as the Central Office, and from which a hundred or more wires proceed in different directions to distant cities. From this office, for example, six or more wires go to Chicago, all of them kept busy every day, sending and receiving messages to and from that city. In this same City of New York are several offices, such as the Produce Exchange, to which are given loop wires so that they can use the direct Chicago wires to transmit their business just as facily and promptly as if sent from the Central Office. This is what excites our friend's ire. He claims that in doing this an unjust advantage is given. He claims, in fact, that the Central Office is the genuine ticket office, and nobody has any right to buy elsewhere. He claims, in other words, that a man has no rights of direct transmission which a Telegraph Company can respect, unless he comes to 145 Broadway. It is true the Central Office is a very important one. The very fact that our sanctum is there proves it to be so. But why a message offered there should be preferred to one offered in Wall street, so that the one should wait for the other, it is difficult to see. Two offices, with a wire each to a distant city, have exactly equal rights, and loops are given to destroy this central idea and multiply the facilities which a so-called central office is supposed exclusively to enjoy. The policy of the Company is to give direct wires to as many offices as possible, so that all business may find its way rapidly to its destination.

The same argument is applied to the numerous wires which go to the same terminus from the Central Office. Each wire is the equal of each other wire, and business is distributed as fairly as possible among them all. The idea that communication to a city like Chicago must be treated like a single track railroad, with a single ticket office, to which all must come or go by later trains, seems too absurd an idea on which to waste an argument.

THE Westphalian Union of Hamm exhibited at Vienna several hollow iron cylinders filled internally with a stony mass, for which greater strength is claimed than that of unfilled columns with walls of the same thickness, and which may find extensive use for telegraph poles and building purposes. They are made by rolling a pile of puddled bars, filled with a peculiar sandy mixture, at a heat at which the sandy mass will fuse and unite with the iron walls.

THE NEW CODE OF RULES.

Since our last issue samples of packages of prepared rules for different departments of service have been mailed to a number of parties for critical examination, correction, dissent, substitution, enlargement. They are not to be regarded as in any respect official. They have not yet been submitted for executive action. The compiler does not believe in every thing he has printed. They are sent to challenge the production of something better, and which it is hoped may be thus provoked. We will endeavor to get some of these rules in the JOURNAL as space may be had. It is a good thing that a great company can thus appeal to and receive the aid of the experience of the men who serve it in its various departments of labor.

THE HUBBARD SCHEME AGAIN.

On the morning of Wednesday, May 27th, at Washington, the House Committee on Appropriations heard Grosvenor P. Lowrey on the subject of the postal telegraph, appearing on behalf of the Western Union Telegraph Company, arguing against the constitutionality of the Hubbard bill.

Mr. Lowrey also introduced statistics, showing that the Western Union Company operates more miles of telegraph line than all Switzerland, Sweden, Holland, Belgium, Hungary, Spain, Bavaria, Denmark, Norway, Portugal, Greece, Wurtemberg, and Great Britain combined. It operates more miles of telegraph, and annually transmits more messages than all Germany, Spain, Hungary and Russia, notwithstanding the fact that these countries have nearly the same area of territory, and nearly four times the population of the United States. Europe has a population of 300,000,000, and sends annually 50,000,000 messages, being one message to six persons. The United States have 40,000,000 inhabitants, and the Western Union Company alone sends 15,000,000 messages, being one message to two and a half persons. In 1863, England had 80,466 miles of telegraph wire, and in 1873, 99,918 miles; being an increase of 22,936, or 28 per cent. In 1866, the Western Union Company had 75,686 miles of telegraph wire, and in 1873, 173,517; being an increase of 97,831, or 120 per cent. In 1866 England had 2,151 telegraph offices, and in 1873, 5,474 do.; being an increase of 3,323, or 154 per cent. In 1866 the Western Union Company had 2,250 offices, and in 1873, 5,955; being an increase of 3,705, or 164 per cent. In 1867 England transmitted 7,500,000 messages, and in 1872, 14,858,000; being an increase of 7,358,000, or 98 per cent. In 1868 the Western Union Company sent 5,783,894 messages, and in 1873, 13,362,832; being an increase of 7,578,938 messages, or 133 per cent.

In 1868 the average toll upon the English lines was 88 cents per message. In 1874 the average toll is 28, being a reduction of ten cents per message, or 26 per cent. In 1868 the average toll upon the Western Union lines was \$1.10 per message, and in 1874, 55 cents, being a reduction of 55 cents per message, or 50 per cent.

John K. Porter and George B. Prescott, the electrician of the Western Union Company, were also present before the Committee.

MR. TUNIS J. POWELL, formerly of the Auditor's Department of the Western Union Company, has been appointed Secretary and Treasurer of the American District Telegraph Company of Brooklyn L. I.

DIRECTORY

OF THE

WESTERN UNION TELEGRAPH COMPANY.

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William Orton,	James H. Banker,
Alonzo B. Cornell,	Harrison Durkee,
Norvin Green,	Joseph Harker,
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The Central Division embraces Ohio, Michigan, Indiana, Illinois, Iowa, Wisconsin, Missouri, (exclusive of the route of the Iron Mountain Railroad, south of St. Louis,) Kansas, Indian Territory, Nebraska, Colorado, Wyoming, New Mexico, Utah, Idaho and Montana, Pennsylvania west of Altoona, and New York west of and including Salamanca and Buffalo.

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8. David H. Bates, Philadelphia, Pa.
9. William J. Holmes, New York.
10. Augustus G. Davis, Baltimore, Md.

The Eastern Division embraces Nova Scotia, New Brunswick, Maine, New Hampshire, Vermont, Massachusetts, Rhode Island, Connecticut, New York, (east of Buffalo), Pennsylvania, (east of and including Altoona and Bedford), New Jersey, Delaware, Maryland, West Virginia, and the District of Columbia.

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3. John A. Brenner, Augusta, Ga.
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- Jas. Compton, Ass't, Jackson, Miss.
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The Southern Division embraces Texas, Louisiana, Mississippi, Arkansas, Lower Missouri, Kentucky, Tennessee, Alabama, Georgia, Northern Florida, South Carolina, North Carolina, and Virginia.

PACIFIC DIVISION.

General Superintendent.

James Gamble, San Francisco, Cal.

Asst.-General Superintendent.

Frank Jaynes, San Francisco, Cal.

District Superintendents.

1. Frank H. Lamb, Sacramento, Cal.
2. Frank Bell, Reno, Nevada.
- P. H. Lovell, Ass't, Eureka, Nevada.
3. O. P. S. Plummer, Portland, Oregon.
4. Rufus R. Haines, Los Angeles, Cal.

The Pacific Division embraces California, Nevada, Oregon, Washington Territory, British Columbia, Utah, west of and including Corinne and Arizona.

JOURNAL OF THE TELEGRAPH—Frederick J. Grace, Editor.

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Austin H. Watson, Keeper of Stores, New York.

Thomas Orton, Supply Agent, Chicago, Ill.

Manufactories.

George M. Phelps, Superintendent, New York.

William H. Johnson, Superintendent, Louisville, Ky.

THE AMERICAN DISTRICT TELEGRAPH

The patrol system, established by the American District Telegraph Company in the Fifteenth District, the office of which is at 397 Broadway, by which subscribers' stores are visited regularly every hour, is to be introduced in the Tenth and Nineteenth Districts, also, and patrol boxes are about to be placed in position in the latter districts.

The office of the Thirty-first District, formerly at 907 Broadway, has been removed to 946 Broadway—adjoining Dodd's Express.

The company have commenced canvassing for subscribers with a view to the establishment of the Thirty-sixth District, with headquarters at Sixty-fifth street and Third Avenue.

THE TELEGRAPH IN JAPAN.

The rapid progress which the Japanese are making is very forcibly shown in their telegraphic extensions. Mr. Thomas J. Larkin, who has been in that country for the last three years—having gone out there from England under an engagement with the Japanese Government, is the Superintendent of the Telegraphs. The metropolis, Tokio, is fully connected by telegraph to all the principal points, twelve stations having been opened in that city. The whole system is constructed on Siemens' iron poles. The lines have been extended about two hundred miles to the north, with a railway system in process of construction. The instruments principally used upon the Japanese lines are Siemens' Morse, worked by the polarized relay, Hawley's Morse (which is not a favorite), Breguet's dial instruments, and, for railway purposes, Siemens' needle instruments and blocks. Porcelain

insulators are used, and made in the country, as also galvanized iron for the wires.

The work of construction is being pushed north of Yokohama to Hokodadi. The Japanese operators are becoming quite expert manipulators, and bid fair to prove, in the future, good telegraphers. All of them understand more or less of the English language.

The Japanese use the wires extensively, and the institution is likely to repay the Government, which owns the lines, very well.

Immense Reduction of Prices!

New York, May 30, 1874.

We are offering our TELEGRAPH INSTRUMENTS at 20 per cent. Discount from our list, or from the present published price list of any other manufacturer of first-class Telegraph Instruments. Quality will be strictly maintained.

L. G. TILLOTSON & CO.,

8 DEY STREET, NEW YORK.

GEO. H. BLISS & CO.,

Telegraph Machinery

AND SUPPLIES,

Hotel Annunciators,

Electrical & Electro-Medical Apparatus,

41 THIRD AVENUE,

Chicago, Ill.

ATTENTION, OPERATORS!



(Patent applied for.)

AMATEUR TELEGRAPHIC INSTRUMENT, Or "Snapper" Sounder.

We have arranged to manufacture and offer for sale a large number of these useful and popular instruments

AT GREATLY REDUCED RATES.

Our facilities are such as to enable us to place upon the market an article superior in design and finish to any that are sold by either Mr. James M. Foster or Mr. R. W. Pope.

As an illustration of some of the essential respects in which this instrument excels all others of its class, we will specify:

1st. The equality of the sound. The indentation of the springs are not formed by a hammer (as in those of other manufacture, where the sound produced is very unequal), but shaped in a die, and consequently emitting a sound both equal and pleasing.

2d. The joining of the spring to the base. Barbs are introduced so as to render the spring immovable from the base. *This spring is absolutely secure.*

In short, this is a stronger, handsomer, *CHEAPER* and more durable instrument in every way than any heretofore offered.

To those who have not seen this instrument, we would say that it combines a Relay, Sounder and Key, and is of the size represented in the cut; made of best britannia, with fine steel spring, and mountings of brass or German silver.

REDUCTION.—We sell these instruments only in lots of no less than six, having found that parties ordering once, invariably send for more, the expense by the half dozen or dozen being but very little more than we should charge for a single instrument.

Instruments, plain, per half dozen.....\$1 00
do polished and plated, per half dozen... 1 50

N.B.—We make no instruments with knobs attached, as they are very unpopular, from the fact that they necessitate a cramped position of the hand in manipulation. The "Morse Alphabet" will accompany instruments if desired.

TERMS.—Cash in advance by Money Order. Postage paid by us in all cases. Agents wanted all over the United States and Canada.

MONA MANUFACTURING CO.,

P. O. Box 178, Newark, N. J.

THE "SNAPPER" SOUNDER.



SPECIAL NOTICE.

All orders dated on and after June 1st will be filled with the new style polished "SNAPPERS" at the original price of 30c., or 6 for \$1.50. A few of the old style on hand will be closed out at 25c. each, or 6 for \$1.25.

June 1st, 1874.

R. W. POPE,

Box 5,278.

GO TO HEAD-QUARTERS

FOR ALL

Telegraph Supplies,

AND BUY YOUR INSTRUMENTS AT

20 PER CENT. DISCOUNT
FROM LIST PRICE.

L. G. TILLOTSON & CO.,
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THE GREAT RUSH at No. 8 DEY STREET is caused in part by the offer of 20 per cent. Discount from list prices on all Telegraph Instruments manufactured by

L. G. TILLOTSON & CO.,
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The "Snapper" Sounder,

PATENT APPLIED FOR.

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STYLES. PRICES.

The unexpected and growing demand for the original "Snapper" Sounder, beyond the expectations of the manufacturers, has delayed the introduction of proposed styles and improvements.

Having increased our facilities and accumulated sufficient stock to enable us to fill orders promptly, the following varieties are now offered for sale at prices which will accommodate all classes.

The "SNAPPER SOUNDER," polished, - - 30c.
or 6 for \$1.50.

Ditto, polished and plated spring, - - 40c.
or 6 for \$2.00.

A few were manufactured to order, with hard rubber knobs. They were so well liked that I have decided to introduce them to the fraternity. The springs are secured by two screws, and in case of breakage may be replaced at an expense of 15 cents. They are thoroughly made and finished.

PRICE 75 CENTS.

A liberal discount to agents.

Canadian customers will please remit 5 cents extra for postage.

R. W. POPE,
Box 5278, N. Y.

SMITH & HALL,
Montreal Tel. Co., Agents for Dominion.
HAMILTON, ONT..

Immense Reduction of Prices!

We offer 20 per cent. Discount from list prices on all of the celebrated Telegraph Instruments of our manufacture. Quality of Instruments will be strictly maintained.

L. G. TILLOTSON & CO.,
8 DEY STREET, NEW YORK.

Specie Basis reached at last!

We offer 20 per cent. Discount from list price on all instruments of our manufacture.

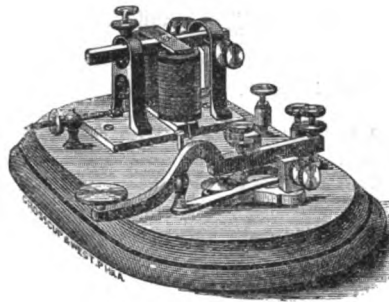
L. G. TILLOTSON & CO.,
8 DEY STREET, NEW YORK.

Hard Pan Discovered!

L. G. TILLOTSON & CO.,
8 DEY STREET, NEW YORK.

Are offering 20 per cent. Discount from list prices on all instruments of their manufacture. The quality of the instruments will be strictly maintained.

THE PENNSYLVANIA TELEGRAPHIC AGENCY,
WAVERLY HEIGHTS, PENNSYLVANIA.
PEERLESS.



Nickel Plated.

FULL SIZE RAILROAD SOUNDER AND KEY.

NOTHING MADE OF CAST OR PAINTED IRON. Is finely finished, mounted on Walnut base.

1 cell Calland Battery, office wire, chemicals, copy Smith's Manual, sent C. O. D. \$12 50
If money be sent in advance by registered letter. 12 00
Instruments without Battery. 11 50
Telegraphic and Electrical goods of every description at manufacturers' lowest prices.

Send for Circular.

Red Star Line

PHILADELPHIA AND ANTWERP,

Appointed to carry the Belgian and United States Mails.

The following Steamers are appointed to sail

FOR ANTWERP.

From Philadelphia.	From New York.
VADERLAND, May 2.	SWITZERLAND, May 18.
CYBELE, May 23.	June 6.

FROM ANTWERP.

For Philadelphia.	For New York.
CYBELE, April 29.	May 13.
VADERLAND, May 27.	SWITZERLAND, June 10.

PRICES OF PASSAGE IN CURRENCY.

First Cabin, - \$80. Second Cabin, - \$60.
Steerage, - \$25.

Prepaid Certificates, \$25

Passenger accommodations for all classes unsurpassed. Ample attendance is provided. Every steamer carries a surgeon and stewardess.

Through tickets and through Bills of Lading issued between all prominent points.

For passage, rates of freight, and other information, apply to
PETER WRIGHT & SONS, Gen'l Ag'ts,
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B. vonder Becke, General European Agent, Antwerp.

AMERICAN LINE.

The American Steamship Company of Philadelphia.

Weekly Mail Steamship service between

PHILADELPHIA AND LIVERPOOL,

CALLING AT QUEENSTOWN,

Sailing every Thursday from Philadelphia and

Sailing every Wednesday from Liverpool.

The following Steamers are appointed to sail from Philadelphia.

OHIO, June 1.	ABBOTSFORD, June 25.
*KENILWORTH, June 11.	PENNSYLVANIA, July 2.
INDIANA, June 18.	ILLINOIS, July 9.

PRICES OF PASSAGE IN CURRENCY.

Cabin \$75 to \$100 according to accommodations.
Intermediate, - \$35. Prepaid Intermediate, \$40.
Steerage, - \$25. Prepaid Steerage, \$25.

Steamers marked with a star do not carry intermediate.

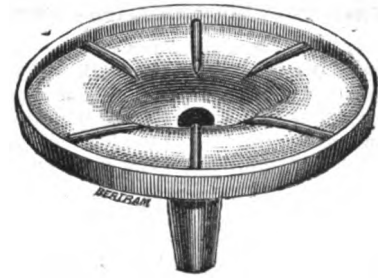
Passenger accommodations for all classes unsurpassed. Ample attendance is provided. Every steamer carries a surgeon and stewardess.

These Steamers are supplied with Life-Rafts in addition to the usual Life-Boats and Life-Preservers.

Through tickets and through Bills of Lading issued between all prominent points.

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PATENT BATTERY INSULATOR.



"As near perfect as we can reasonably expect in a contrivance for this purpose."

THE BEST BATTERY INSULATOR IN USE.

OVER 4,000 FURNISHED THE WESTERN UNION TELEGRAPH COMPANY UP TO THIS TIME.

The Montreal Telegraph Company have adopted them, and have 2,500 now in use in their principal offices.

THEY THOROUGHLY INSULATE THE BATTERY,
and save more than their cost.

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Liberate reduction for large quantities.

A VERY SUPERIOR SCREW GLASS INSULATOR CHEAP.

All kinds of Telegraph and Electrical Supplies on hand.

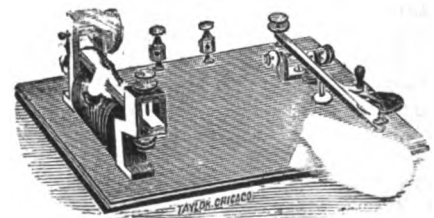
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SEND FOR CATALOGUE.

THE AMATEUR'S Telegraph Apparatus.

(PATENTED APRIL 16TH, 1872.)



With this Instrument is furnished

A Complete Outfit for the Student,

INCLUDING

BATTERY,

CHEMICALS, and

MANUAL.

There are several thousand in use.

PRICES:

Complete Outfit	\$7 00
Sounder and Key	6 00
" " with Out-Out and Lightning Arrester	7 00
Sounder No. 3	4 00
" No. 4	3 00
Key No. 4	4 00

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JOURNAL OF THE TELEGRAPH.

VOL. VII. NO. 12.

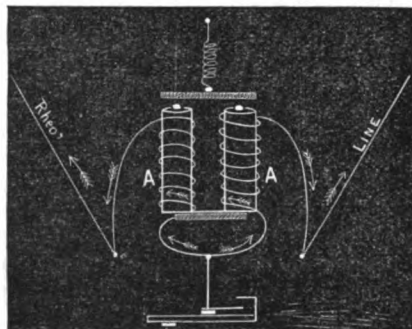
NEW YORK, JUNE 15, 1874.

WHOLE NO. 159

DUPLEX RELAYS.

By F. W. JONES.

It may be a useful fact, if generally known, that a common relay can be converted into a differential duplex relay with but very little trouble. Emergencies have arisen when this knowledge has been used to very great advantage. A wire is worked duplex between Chicago and Salt Lake City, 1,556 miles, through two repeaters—one at Omaha, and one at Cheyenne. A terrific lightning storm came up at the latter place, last month, and burned a coil in each duplex relay there. In a short time they were both replaced with common relays, and "all went merry as a marriage bell," rendering valuable service to the Company in doing a double business at a time when it was delayed. Milwaukee also had the mishap, a few days ago, to lose three duplex relays within a few moments of each other, from effects of lightning, at a time, too, when the storm had swept down all but one wire. A few moments sufficed to connect up a common relay and make one wire do the work of two. The following diagram will show the connections:



The transmitter wire is connected at the point where the wires are spliced connecting one coil to the other. The rheostat connects with one terminal of relay, and the line with the other. The outgoing current divides equally between the coils, but, traveling in opposite directions, no magnetism will be developed in the cores. Were the magnets extended in a straight line instead of the horse-shoe form, it will be seen that on one side the current flows toward A, and oppositely on the other side. For long circuits, large resistance relays must be selected to obtain best magnetic effect of incoming current. Duplex relays are more sensitive than common relays to effects of lightning, from the fact that they are generally wound with finer wire, and that two channels to earth are open through them—one *via* the transmitter and one *via* the rheostat. Care should be taken to remove them from circuit during thunder storms, except where the urgency of business outweighs the risk of a burned relay.

[The above arrangement was patented by Mr. Stearns in 1868. In 1871-72, in working with the

duplex system between New York and Albany, ordinary relays connected as described by Mr. Jones, were successfully worked. A more general knowledge of the fact, however, as suggested, will probably be of service in cases of emergency.]

CANADA AND TELEGRAPHS.

From the Railway News.

A statement which appears to us wholly unintelligible, appears in the *Times* of Thursday. It is to the effect that the Legislature of Ottawa has enacted that no cables shall be allowed on territory belonging to the Dominion possessing exclusive right in any other country. The only cable that exists with exclusive right is that of the Anglo-American, and this, at Newfoundland, is on territory which is sought to be incorporated with as a portion of the Dominion of Canada. It cannot be supposed for an instant that the Government of Canada are so utterly unmindful of the interests of those engaged in its trade and commerce as to insist that they shall be cut off from communication with Europe, because messages can only be transmitted over cables which would never have been laid but for the privileges accorded to them years ago by local and imperial legislation. We believe the statement to be merely one of those hoaxes or "shaves" which from time to time are got up by speculators for purposes of their own, for no Government would act with so much stupidity, or with such utter disregard to existing rights, as to enact that its merchants and others should hold no communication with other parts of the world through a cable which holds "an exclusive right in any other country." To carry out such an act would be to place Canada in a state of comparative ostracism from the rest of the world. Should such an Act be passed, the Anglo-American Cable Company and its principal ally, the Western Union Telegraph Company, would be justified in retaliating, by imposing a discriminate tariff on all messages passing to and from Canada over their lines and cables. This attempt at tampering with existing rights and privileges has naturally excited considerable surprise, and its effect was at once shown in the depreciation of several descriptions of Canadian railway securities. A more impolitic act could not have been committed by the Legislature of Canada than their endeavouring to ignore existing rights, and it is especially ill-timed now that the Government are about to seek proposals for raising capital in this country to carry out their Canadian Pacific Railway.

So far as the Anglo-American Company is concerned, they can have no possible wish to land cables in Canada. They possess the right granted to them by local and imperial legislation of landing cables on the shore of Newfoundland, and have no more idea of taking one to Canada than they have to Kamtschatka. It is simply ridiculous for the Government of the Dominion to go through the solemn farce of interdicting the landing of cables on its

territory, and it reminds one of the reply of the damsel to her lover, "Nobody asked you, sir," she said. It is still more ridiculous to make it a condition precedent of laying a cable in Canada that the parties doing so should give up the exclusive privileges which they possess in any other countries. The recent exposures of the scandalous conduct of the Government of Canada in connection with the grant of the charter of the Canadian Pacific Railway appears to have had a remarkable effect upon their successors in office. The late Government retired under the storm of indignation created by their sacrifice to American speculators of the interests of their country in to the Pacific Railway. The present Government desire to mark their accession to office by a gratuitous attempt to confiscate, so far as they can do so, those rights and privileges of the Atlantic Telegraph Company from the exercise of which the Dominion has received such great commercial benefits. So far as we can understand the action of the Legislature, it is nothing more than an empty refusal of a request which has never been made, and an attempt to compel the cession of valuable rights already in possession in return for an illusory privilege. The Government of Canada is said to be engaged in discussing the terms of a renewal of the reciprocity treaty with the United States. If they are consistent, and are excited with so much virtuous indignation at monopoly, they will, of course, except from the action of reciprocity all telegraphic messages passing through the States to Canada, or *vice versa*, which may have to be sent across the Atlantic by a cable belonging to the Anglo-American Company, although authorized, landed, and working on an adjoining territory.

We are glad to see that the bare announcement of this policy of gratuitous confiscation has called forth an expression of opinion on the part of a correspondent of the *Times* entitled to the highest respect, who states:—

"I am not aware that Canada has ever accorded exclusive rights either of landing or working to any company. The principal you refer to of exacting freedom and reciprocity may admit of discussion; but I will venture to say that if any of the existing companies possess vested rights these will either be most scrupulously respected, or, if considerations of public policy, in the sense of checking any further monopoly in the means of communication between England and America, require them to be interfered with, full indemnity will be accorded."

THE GOVERNMENT TELEGRAPHS OF JAPAN.—The position of Superintendent-in-Chief of the Government Telegraphs in Japan has been offered to and accepted by Mr. Edward Gilbert, Telegraph Engineer and Superintendent of the North British Railway. Mr. Gilbert, who has been engaged in the telegraph service of the Electric and International Company, the Caledonian Railway, and the North British Railway for a period of twenty-seven years, will, we understand, leave for Japan shortly to assume the duties of his office.

LIGHT CABLES.

Mr. W. M. Bullivant, of London, has published a pamphlet in which he claims to show the great advantages of manilla hemp-covered cables for deep sea telegraphy, over all other types of cables that have hitherto been used, and to show that the present type of cable laid in the Atlantic has failed in a very short time wherever it has been laid.

He advocates for shore-ends and shallow water, heavy iron-clad cables covered with a coating of bituminous compound; and for deep water, manilla hemp-covered cables, which are practically imperishable in sea water.

He claims that such cables will be easier laid, with less risk in paying out, more durable, and much easier raised for repair than the present Atlantic cable.

He advocates laying across the Atlantic three manilla hemp-covered cables, that will each transmit ten words per minute, (together thirty words per minute) and cost only the same as one of the present Atlantic cables, transmitting fifteen words per minute.

The pamphlet describes the manufacture of the manilla hemp cable as proposed by the author, as follows:

"The core will be of the usual kind, a stranded copper conductor, insulated with gutta percha in the best manner, and equal, as regards the quality of the materials, to any of the existing cores, capable of transmitting ten words a minute through a length of 2,000 miles.

The core is covered with the best manilla yarn—there are altogether twenty-four yarns in number, ten for the inner and fourteen for the outer covering. The yarns are laid on with a very long "lay," and previous to laying up each yarn is passed through a bath of compound, which in addition to acting as a strong preservative, prevents, in a very great measure shrinkage. The second covering of manilla yarn is laid on in the opposite direction to the first. After this second covering the cable receives a "whipping" of light yarns, and then passes through a bath of compound and silica; the cable is then complete, and is coiled away and kept in the tanks and under water.

The completed cable is of the total weight of 11 cwt. in air, but of less than 2 cwt. in water.

Its breaking strain is over 40 cwt., so that the cable will be able to bear twenty miles of its own weight in water before breaking.

From numerous experiments which I have made, the elongation before breaking is less than three per cent., and as the core is capable of stretching as much as 24 per cent., it is evident that all the strain must be taken by the manilla covering, before the core can be in the slightest degree injured."

The advantages claimed for this form of cable are thus summed up:

- 1.—Ease and rapidity of manufacture.
- 2.—Small specific gravity, allowing, on account of diminished size and weight, the employment of moderate sized vessels.
- 3.—Facility of submergence, no heavy paying out gear being required.
- 4.—Durability. Only hemp (tarred) being used, there is nothing to decay it, and its recovery consequently would be a matter of ease and certainty, the cable being strong enough to bear twenty miles of its own weight in water.
- 5.—Economy of construction and submersion, so that three cables of this type may be manufactured and submerged, for one of the Atlantic type.

THE SURVEY FOR THE PACIFIC CABLE.

The U. S. steamer *Tuscarora*, engaged in soundings for the Pacific cable, arrived at Yokohama, Japan, April 22nd, after a passage of thirty-four days from Honolulu, Sandwich Islands, via Port Lloyd, Bonin Islands. The survey of the southern route, from San Diego, California, to Yokohama, via the Sandwich Islands, is now complete. The result of the first portion of the survey, from San Diego to Honolulu, has already appeared in these columns. We gather from the report of Commander Belknap to the Navy Department that the weather, after leaving Honolulu, was generally very favorable for the work, and that seventy-three casts were made, the deepest being 8,287 fathoms, at which depth the working of the patent reel of Sir William Thomson and the piano wire was as admirable and satisfactory as ever. At that great depth a person standing on the topgallant fore-castle, and watching the running out of the wire from the reel in the gangway, could tell the moment bottom was reached.

A glance at the profile charts shows that after the ocean bed proper is reached, near San Diego, the bed descends in comparatively gentle curves and undulations to the vicinity of the Hawaiian Islands, where a depth of 3,054 fathoms is found; thence, westward, the bed slowly drops till the lead reaches down to 3,287 fathoms, or about three and three-quarters statute miles, in the neighborhood of the Bonin group.

But, while the bed is comparatively regular, and the character of its soil nearly uniform between San Diego and Honolulu, a range of submarine mountains is found to exist between the Hawaiian and Bonin groups, with soil of varying character, the valleys sending up light yellow-brown ooze or mud in the specimen cups, and the sides and tops of the mountains, coral limestone and sand, with fragments of lava. In three or four instances, too, solid rock was struck, the cups coming up empty and the points freshly battered. In others the ooze from the plateaus was found to contain particles and fragments of lava; and in one specimen brought up, sixty miles from the base of one of the submarine peaks, quite a lump of the same material was found. Coral, sand and lava is also found all the way from the Bonin group to the coast of Japan, and, in short the entire region west of the Hawaiian Islands would seem to have been subjected, at some remote period, to volcanic disturbances.

Six of these submarine mountains were discovered, ranging from 7,000 feet to 12,600 feet in height, and Marcus Island, which rises scarcely more than from thirty to sixty feet above the surface, lies directly in this range. A cast some eight miles from that island gave a depth of 1,499 fathoms, coral and lava bottom, and the high, wide white beach, occasionally broken with large, black, volcanic-looking rocks, presented the same dazzling white appearance characteristic of the beaches on the shores of the Bonin Group; and those beaches are all composed of broken coral. Hence it may not be unreasonable to suppose that Marcus Island forms the apex of a volcanic cone or island, perhaps, in ages past, much higher than now. A thick growth of trees crowns the island, and myriads of birds were flying over and around it.

The ocean bed between the Bonin and the entrance of Jeddo Bay is irregular, as might have been supposed, from the almost continuous chain of islands, lying nearly parallel to the route sounded. The deepest water found was 2,435 fathoms and the next deepest 1,669 fathoms.

Should a cable ever be laid by this southern route a good place to land it in Port Lloyd would be in or near the ten-fathom hole.

THE ATTACK OF AUSTRALIAN SAVAGES UPON THE BARROW'S CREEK TELEGRAPH STATION.

The following details of the attack of the Australian savages upon the Barrow's Creek telegraph station have been forwarded to the Adelaide Journals by Mr. Todd, Superintendent of Telegraphs: On the evening of Sunday, Feb. 22d, the whole of the station party, consisting of Mr. Stapleton, the master, and seven others, including a civilized native boy, were outside the building, smoking. They were holding a conversation with a young black fellow whom they proposed sending up the line on horseback with one of the linemen, when they were suddenly attacked from the eastern corner of the station house by a large body of natives, who speared Mr. Stapleton. Being perfectly unarmed the assailed made immediately for their station, to which there is only one mode of ingress; but here they were repulsed by a shower of weapons, and Mr. Flint, the assistant operator, and police trooper Gason were both wounded. Finding their retreat fenced off, they ran around the building in the hope that they would be followed. This *ruse* appears to have been successful, for on making a second attempt to enter the gate, they found it unguarded, and they accordingly entered; but not before John Frank, one of the linemen, had been fatally wounded. The party, when inside the building, which is secure as a fortress, immediately armed themselves, and three shots were fired through the window at a body of natives at a distance of twenty yards, and afterwards two rifle shots at a distance of 100 yards. Next day, at 7 A. M., the natives made their appearance all armed, and seemed meditating a second attack, and four rifle shots, reaching a distance of 500 yards, were fired to disperse them. The trooper reports that it is probable that one or two of the shots took effect, as some of the natives were seen to fall, and he thinks there is no doubt that some of the natives were mortally wounded in the affray of Sunday evening. John Frank, the lineman, was speared in his right side, the weapon penetrating his heart and passing through the back in a downward direction. He died immediately after entering the kitchen. Mr. Stapleton, the station master, was also fatally injured. He was wounded in the left side, the size of the wound being reported to be about one inch broad and three inches deep. He also received a nasty injury in the left thigh. He died on Monday afternoon. Mr. Flint, the operator, was speared in the leg, and the wound penetrated to the bone, at a distance of seven inches below the hip. The black boy, who was saved by being dragged through the window, was wounded half an inch below the right collar bone. He also received a spear wound in the left side between his fourth and fifth ribs, and his right hand was badly torn. It is stated that the object of the natives in making the attack was to obtain supplies of flour and mutton. There are six men all told at each of the interior stations, and sometimes the work is warm enough for them. The natives pull the wire down and cut away great quantities of it for the purpose of arming the points of their spears. They also smash the porcelain insulators and use the sharp edged pieces to scrape their spear blades into shape.

Of all solid substances found upon the earth, carbon is both the hardest and the softest. In the form of diamond, it is the hardest. In the form of graphite, it is the softest. Both diamond and graphite are the same in chemical composition.

ELECTROPLATING WITH COBALT.

The following process of George W. Beardslee, of Brooklyn, N. Y., is stated to form a thick and useful covering, which will very perfectly protect the plated surface from the action of the elements, and form a most beautiful plating, very white, exceedingly hard and durable, tenaciously adherent, and not liable to tarnish.

Dissolve the pure metal cobalt in boiling muriatic acid, and evaporate this solution to dryness. Then dissolve from four to six ounces of the salt thus obtained in a gallon of distilled water, to which add ammonia sufficient to show on test paper the solution just slightly alkaline. Then prepare an anode of the metal cobalt, in granular form or broken into small pieces, free from impurities, as follows: Take a plate of carbon, or of some other material that is a conductor of electricity, but not susceptible of being attacked by the plating solution, and place it within a sack or envelope made of some material that is neither a conductor of electricity nor attackable by the solution, formed with open meshes or interstices through which the solution may freely circulate. This envelope should be made to conform in shape to the carbon plate, and large enough to leave a space between it and the plate of, say, one half an inch to one inch; then fill this space with the granules of cobalt, which will, as is evident, surround the plate and be in contact with it.

By an anode thus constructed, a large surface of the cobalt is readily and conveniently exposed to the action of the solvent, and the steady flow of the entire battery current through the cobalt is secured, thereby rendering the dissolution and disposition of the metal, steady, uniform, and very perfect.

This anode is to be connected with the copper pole of the battery by connecting the wire to the carbon plate and suspending in the plating solution before described, and the article to be plated is connected in the solution with the zinc pole in the usual way. A battery of from two to five cells (Smee's battery) will be sufficient to do good work. Care should be taken not to permit the solution to lose its slightly alkaline character, as, if this is not maintained, the plating operation will be rendered imperfect, the tenacity, adherence and uniformity of the deposit becoming thereby impaired.

A THEORY OF THE SOURCE OF TERRESTRIAL MAGNETISM.—*Professor Challis.*—This theory attributes magnetic streams to impulses given to the ether by the earth's atoms in motion. The author first seeks to show that the earth's motion of translation can have little or no magnetic effect. Then, as to rotation, the theory is, briefly, as follows: While there is any relative circular motion between the ether and the atoms, the latter will continually impel the ether till the relative motion is reduced to zero. Ultimately, therefore, the circular motion of the ether, within the earth, is the same as that of the atoms by which it is impressed. By reason of centrifugal force the circular motion will produce in the external ether an amount of circular motion decreasing with distance from the axis of revolution. Now, the earth's rotatory motion will tend to draw the ether from the axis equally in all directions in any given transverse plane; and the external ether will rush in at the pole parts to supply any vacancy arising from centrifugal force. If the solid and fluid parts of the earth were symmetrical with respect to the equatorial plane, these tendencies would just counteract each other, the influx at each pole would be stopped, and no currents, other than the circular, would be generated. But, the case being otherwise,

there is a differential action, whereby streams are produced, which, as circulating, are permanent relatively to the earth. The currents being always towards the positions of greatest atom-density, they will flow out of the northern parts (in which land preponderates), and, after circulating, enter into the southern parts. And it is in accordance with the theory that in the Northern Hemisphere there are two positions of maximum intensity; one in a high latitude of the North American Continent, the other a little north of the Asiatic. There is not the same reason for two maxima in the Southern Hemisphere; and, in fact, observation shows that, if there be two, they cannot be far apart. Hence, too, the theory accounts for the circumstance that the magnetic intensity is greatest near the South Pole; for the total influx is necessarily equal to the total efflux; and the influx is intensified in that quarter either because there is but one position of maximum intensity, or, if there be two, because they are near each other. The author finds further support for this theory in certain phenomena of aberration, as showing the reality of an impulsive action between atoms and ether.

CONDUCTIBILITY OF MAGNETIC TENSIONS.—*M. Jamin.*—The expression *coercitive force* has been used to denote the difficulty of magnetizing iron or steel, and the resistance opposed to the causes of demagnetization. This is somewhat vague M. Jamin says. Suppose an iron bar brought near to, say, the austral end of an electro-magnetized bar. The former takes boreal magnetism at its nearest end, austral at its furthest. There is a mean line always between the middle and the core. It nears this core as the bar nears it, and finally disappears when the bar comes into contact with the core. Then the boreal tension is wholly concentrated at the face of contact, concealed by an equal magnetism accumulated in the core. There remains only austral tension prolonged from the core to all points of the bar. Here note two essential things:—1. The tension is always the same on the two sides of the face of contact; on one hand in the core, on the other in the bar; there is magnetic equilibrium without a difference, a fall between the two metals. 2. The austral tension continues along the bar to its free end almost without diminution of intensity, if the bar do not exceed 85 centimetres. Thus soft iron has the double property of becoming in equilibrium of tension with a magnet which it touches, and of propagating this tension through its substance to great distances. This is its essential character, which may be expressed by saying that it is a *good conductor of magnetic tensions*. Steel, again, has a small conductivity for magnetic tensions.

DETERMINATION OF THE TIME OF OSCILLATION OF A MATERIAL PENDULUM.—*Dr. Bender.*—The author's object was to devise a method which would obviate waste of time, and be free of that frequent source of error, the individuality of the observer. The apparatus is (briefly) made on the following principle: If an electric current is sent through a Hipp chronoscope, the clockwork may be going, while the pointer remains stopped. But at the instant the current is interrupted, the pointer also moves. Such an interruption was effected through a second current, which was closed for an instant on the pendulum reaching its lowest position. This current also passes through a writer telegraph, recording the number of oscillations. Should the experiment be interrupted, a new stoppage of the chronoscope is necessary, and this was produced by means of a third, or *relay* current. The mode of action of these currents, as also of a fourth, the *pendulum* current, is fully described.

MAICHE'S ELECTROLYTIC PILE.

Called electrolytic because the current is due to the decomposition of water. This element consists of an amalgamated zinc plate, a plate of rolled iron, and a solution of water acidulated with a tenth part of its own weight of sulphuric acid. The elements are arranged in a case capable of holding 20 or 30 troughs, above which are suspended the plates fixed to a frame, so that when the battery is required for use, the lid is closed, and the plates are simultaneously immersed. For certain practices which do not require a high potential, all the couples are joined in a still more simple manner. A large case encloses the acidulated water, another smaller case, whose bottom is open all its length to allow passage for the solution, receives all the plates placed alternately and joined so that between the iron of one couple, and the zinc of the next following are placed the zinc of the couple which precedes, and the iron of that which follows, forming a double partition without any loss of room. On causing the smaller case to descend, the pile is in working order. This pile, the author says, is designed to obtain oxygen and hydrogen in their *nascent* states, and thereby to maintain electrical conditions constant and contrary for each plate relatively to the other. The theory of the pile M. Maiche propounds thus: The zinc feebly decomposes the solution, whose oxygen, *negatively* charged, in uniting with the zinc abstracts from it some positive electricity, and releases negative electricity which flows along the surface of the zinc plate to the conducting wire. The iron comports itself otherwise; the disengaged hydrogen neutralizes the negative current from the zinc, and thus, the author says, maintains the iron plate in a neutral state. In conclusion, he adds, "My pile is more constant than all others which I have tried. The plates remain clean, *which proves the absence of injurious deposit*. The current is due to the presence on the surface of the plates to a bed of hydrogen and oxygen, incessantly renewed, which produces the same effect as is noticed with plates of platinum employed for electrolysis." This new theory of the cause of the electric current we leave to the student's consideration.—*Les Mondes*.

ON RELATIONS WHICH MAY EXIST BETWEEN THERMO-ELECTRIC PROPERTIES AND CRYSTALLINE FORM.—*M. Friedel.*—The author thinks that hemihedry with inclined faces may be regarded as connected with thermo-electricity in pyrites and cobaltine, but that this hypothesis of his does not appear demonstrable by crystallographic examination. "It is somewhat contradictory to suppose that the positive and negative varieties correspond to hemihedry right and left, which, in the case of hemihedry with parallel faces, are in no way distinguished, and that nevertheless these crystals may be recognized independently of the galvanometric test. If they were distinguished, they would no longer be symmetrical to one another. To give a sure support to this hypothesis (very plausible in itself, and the more attractive that we do not yet know any other physical property connected with hemihedry with parallel faces), it would be necessary to find thermo-electricity in other substances presenting the same hemihedry; unfortunately, crystals affected by it, and which are at the same time good conductors of electricity, are wanting."

INSURANCE of ships was first practiced in the reign of Caesar, in 45. It was a general custom in Europe in 1494. Insurance offices were first established in London in 1667.

CORRESPONDENCE.

TESTING LEAKY LINES—WHAT IS A FARAD ?

To the Editor of the Journal of the Telegraph :

I am under obligations to your correspondent F. W. J. for calling attention to the error in my article on the insulation resistance of leaky lines, which had escaped my notice. It arose from the accidental transposition of the words "insulation resistance" and "conductivity resistance." Whether it was my fault or the printer's I cannot, at this distance of time, tell. At the end of the same article I attempted to correct a misprinted formula in Mr. Haskin's work, but my version of it, as rendered by the printer, was a shade or two worse than the original ; upon which I concluded to let it go, despairing of being able to get it right, and consoling myself by the reflection that it was at least so badly "bulled" that nobody could understand it, and therefore nobody would be likely to be misled by it. F. W. J. need not feel at all backward about coming forward, for I am sure any of us will esteem it a favor if he will point out any errors, either in formulas or doctrines, that he may discover in our contributions.

He is right about occasional defective insulators being "the black sheep that spoil the whole flock." It is not altogether insulators that act this way, but the contacts and badly arranged leading-in wires. In an instance given by Ayrtton, 1 per cent. of bad insulators on a given line increased the consumption of battery material 60 per cent. and caused a loss of 20 per cent. of current at the arriving station.

The difference between the tests of a line with the positive and negative poles of the battery, may arise from various entirely distinct causes, and, in some cases, the mean of the positive and negative readings will give the true resistance, and in others it will not. In testing a line from Wall street, New York, to Hunters Point, about six miles long, I once found an earth current as strong as 5 cells of battery and nearly as steady; but the mean of two positive and two negative readings gave me the true conductivity, agreeing exactly with previous tests. There was almost always some earth current in this line, and I think with proper instruments it might usually have been worked by it without a battery. When this effect arises from a foreign current leaking into the wire, if it is not too unsteady, the mean of reverse readings generally gives a correct result. Testing on a wet day on a line insulated with glass, especially if there are many cracked or broken glasses, there is a good deal of polarization or electrolysis exhibited. I do not think it very probable that the mean of reverse readings would give correct figures in this case, although the question at once arises, what are we to consider the correct figures? I should say that we would get what we want to know practically, if we take the same pole of the battery and the same number of cells we work the line with, and test half of the length of it from each end.

Schwendler's formula, given by F. W. J., applies to cases where there is a foreign electromotive force in the conductor to be tested, such as an earth current or a steady leakage from another wire.

The "authorities" have succeeded in getting the "farad" business pretty well muddled up, but it seems very clear to me that Mr. Brown is right. Latimer Clark is not always a careful writer, and sometimes puzzles the student. Prof. Jenkin, who was Secretary of the British Association Committee which established the electrical units, and who certainly ought to know, says "the unit of current is one farad per second, and is frequently termed, for

brevity, a farad"; and he also says, "the unit of capacity is termed a farad"; and so, in point of fact, is the unit of quantity likewise a farad. This agrees with Prof. Clerk Maxwell's definition. There is really no confusion about the matter, when properly understood. We use the gallon unit in exactly the same sense, for we speak of a quantity of 10 gallons of water, of a vessel of 10 gallons capacity, or of a current of 10 gallons of water per second; and just so of the farad in electricity. The introduction of the Veber unit by Mr. Clark seems to me totally uncalled for, and as only tending to greater confusion where there was more than enough before. I do not think that this unit will ever be generally accepted among electricians, simply because the conception of the farad is so perfectly simple and convenient, when once properly understood, that they will all prefer to use that.

F. L. POPE.

ELIZABETH, N. J., June 3, 1874.

CHILLICOTHE, O., May 28, 1874.

To the Editor of the Journal of the Telegraph :

A. S. Brown, in an article in issue of May 1, says the "farad" is that quantity of electricity which, with an electro-motive force of one volt, flows through a circuit of one ohm resistance in one second of time.

In Latimer Clark's work on Electrical Measurement, edition of 1868, page 44, the farad is given as that quantity of electricity which, with an electro-motive force of one volt, would flow through a resistance of one megohm (1,000,000 ohms) in one second of time.

What is a farad ?

H. K.

To the Editor of the Journal of the Telegraph :

Your correspondent F. W. J., in the JOURNAL of the 1st inst., referring to a communication from me in a previous number, says that I used and defined the term farad differently from any authority he possesses, and thinks it well in the outset to have the matter cleared up to prevent misconception.

Jenkin says (Electricity and Magnetism, page 161): "The unit of current is one farad per second, and is frequently termed, for brevity, a farad, just as in speaking of velocity we often speak of a velocity of 100 feet, the words per second being understood."

Again, on page 162: "About one farad per second would flow if one Daniell's cell were employed to produce a current in a circuit the total resistance of which is one ohm."

Culley, in his latest editions, also gives the same definition and use of the term. I think Clark is the only writer, of those accepted as authority on the subject, who has used the term Veber or Weber as a measure of current, and that electricians generally have found no necessity for using separate terms for units of quantity and capacity. There seems to be no chance for misconception in using the same term here any more than in the use of the words bushel, gallon, etc., which are at once units of capacity and quantity.

A. S. BROWN.

N. Y., June 3, 1874.

VICKSBURG, Miss., June 3, 1874.

To the Editor of the Journal of the Telegraph :

Is your reply to San Antonio, Texas, in JOURNAL of May 1st, 1874, page 132, intended to cover office messages of enquiry about the delivery of messages, which there may be good reasons to inquire about? A case of this kind came up a few days ago. A party telegraphed to Mobile, Ala., intending his message to stop the shipment of some goods; a few days afterwards, the sender called, and stated his

message could not have been delivered, as the goods had come to hand. We sent the customary office message of enquiry to Mobile; Mobile replied, and sent his reply collect, and notified us by mail that he checked our office message against us. Is not a matter like this more between the company and its customer than between the customer and his correspondent? Is it intended to make customers pay for messages of enquiry, which a case of this kind will necessarily call forth? We acted under an order from our Superintendent which seems to cover the grounds very justly. Please answer through the JOURNAL.

VICKSBURG, Miss.

Answer.—It does not follow that a message is undelivered because the directions therein contained have not been executed. Full rates should have been charged for the message of enquiry and the answer. Should it then appear that the company was at fault, under Rule 97 a manager is authorized to refund the tolls.

If Rule 13 had been observed, this case would not have arisen.

To the Editor of the Journal of the Telegraph :

Senatobia sends us message, "answer at Cold Water." Party leaves Cold Water before answer is received there. Our message received paid, answer sent collect; Cold Water can't collect—asks us to; we cannot.

How should such message be checked, or who is responsible for tolls.

R. B. ABBEY, M'gr.

Answer.—Prepayment should have been required upon the message offered as an answer, which was not an answer within the meaning of the regulations. Clearly you are responsible.

FACTS OF ELECTRICITY—Prof. Candido.—The author has been experimenting on the deflection of astatic needles by thermo-electric currents, and he describes here some curious phenomena noticed "by the way." He had a platinum needle mechanically joined (parallel) to the astatic system, but insulated from it. With a certain deflection, this needle came into contact with two opposite vertical wires of platinum, thus closing a circuit, and causing a bell to ring. Now when this contact occurred the platinum needle remained as if held by the vertical wires. To detach it the restituent force of the astatic system did not suffice, nor that of a Daniell battery current sent through the galvanometer in such a direction as to move the needles back. The contact continued, too, when the current no further circulated through the needle and vertical wires. The author supposes that the platinum needle has a continuous minute vibrating movement, in which there are repulsions produced by the circulating current; the needle being repelled, there are opposite polarities at the points of previous contact, and so on. Another phenomenon is this: An iron wire terminating a rheophore from a strong Bunsen battery is put in mercury held in a copper capsule, connected by copper wire with the other pole. A succession of bright sparks appear in the mercury, indicating discontinuity and repulsion, with alternate attraction. The wire is heated and softened, a small pellicle being formed which at length suddenly explodes. Some other movements of attraction are described. Globules of mercury in a vessel of acidulated water were attracted towards a larger mass of mercury at the one side, when one rheophore was put in this mass and the other in the water.

THE London Times has a telegraph wire between London and Paris for its exclusive use, and for which it pays \$15,000 a year.

WEST INDIA AND PANAMA TELEGRAPH.

This company has, by purchasing up the concessions and rights of the Central American Company, not only removed a formidable rival from the field, but has secured a control of the traffic between North and South America for the next forty years, and between each of those grand divisions of the western continent and the Leeward Islands. In order to estimate what may be the extent of this traffic we have to look at the character of the trade of the several countries which will be accommodated by the company's lines and cables. Men are content to wait for ordinary gossip and friendly communications until they can be supplied to them by the ordinary post-office arrangements; but in the markets of the world there is an extraordinary amount of impatience and hunger and thirst after commercial information, and hence it is that where there is much buying and selling of commodities there the electric telegraph is kept in fullest play. Looking to Brazil, to the Platte Districts, to Chili, to Peru, and north of the Isthmus to the States of Central America, we find them producing in abundance all those articles of commerce—cotton, coffee, sugar, tobacco, peltry, bread stuffs, guano, &c.—about which the merchants of London, Liverpool, New York, Boston, Havre, and the other great commercial centres of the world chiefly busy themselves. Again, there is a vast amount of capital, both American and British, invested in remunerative public works in those countries, and in developing their mineral resources, and, as is only natural, the shareholders in these concerns are anxious to be placed on immediate speaking terms with the local managers of those enterprises. Such are the sources from which the company is now deriving, and hopes to increase its revenue, and the more those resources are dealt with the more numerous will be the messages interchanged between the source of supply and the immediate sources of demand. Independently of subsidies, the annual revenue is estimated at £108,000 per annum, not taking into account what may be the annual increment of that trade for the next forty years, during which period, as has been already stated, the West India and Panama Company will enjoy the monopoly of it. The financial arrangements necessary to carry out the agreement with the Central American Company practically involve a very little increase of capital. That company is to receive £900,000 in fully paid-up ordinary £10 shares for the full surrender of their property, which is money's worth for money. A sum of £100,000 will be employed in duplicating and renewing existing lines, as well as to lay the cable to Surinam. There will be issued to the shareholders £100,000 of 10 per cent. second preference shares, which will be to all intents and purposes a working capital. Out of this sum the company will provide a maintaining ship to look after the repairs of the several cables, and thus secure an important saving in the cost of keeping the lines in proper working order. This consolidation brings all the working lines of the world into harmonious action.

The plan proposed is well adapted for resuscitating this unfortunate West India and Panama Company, placing its affairs upon a sound and prosperous basis, and securing at the same time an ample return to the shareholders upon the capital invested. Taking the estimate of the company's original prospectus of a total revenue, with conditional subsidies, of about £170,000 per annum—but the total, after payment of the rebate, to be inclusive instead of exclusive of the North and South American traffic—and allowing £35,000 per annum for working expenses and maintenance of a repairing ship, the balance of £135,000 would suffice to pay a dividend of nearly 7 per cent.

per annum upon the proposed total ordinary capital of the company of £1,471,910, besides providing for the dividend on the preference shares already issued, and on the additional preference capital now proposed to be raised.

THE Administration of the Russian Telegraph Department has just issued a new code of regulations with reference to the employment of females in the service, according to which 90 per cent. of the appointments may be filled by women and girls, whose salaries commence at 300 roubles, rising annually to the maximum of 600 roubles. The latter sum is at present paid only in the Amoor Provinces, whilst in the offices of Russia in Europe the pay ranges between 300 and 420 roubles. Extra gratifications are now promised to those female telegraphists who are able to translate English messages, and can operate with the apparatus on Hughes's system.

The Colony of Demerara, West Indies, has voted \$24,000 for the construction of a telegraph line to connect the west coast of the colony with New Amsterdam.

THE NEW ELECTRIC LIGHT.

On the evening of May 5th, some interesting experiments with MM. Ladygin and Kosloff's electric light were conducted at the engineering works of Messrs. Warner, 10 Diana place, Euston road. To obviate the difficulty of carbon being consumed when burnt in contact with oxygen, M. Ladygin placed sticks of carbon in a closed glass chamber filled with a gas not containing oxygen, but owing to the use of metallic connections the carbon was subject to fracture. The subject was then taken up by M. S. A. Kosloff, of St. Petersburg and 6 Great Winchester street Buildings, London, who has succeeded in overcoming the difficulties by using a special metal of which he forms the holders of the carbon rods, and these are placed in a closed glass chamber.

The lamps which were experimented with were nine in number, six of them having two carbon rods, either of which could be placed in connection with the current of electricity. The rods were all 18 millimetres in length, and one in each lamp was 2 millimetres in thickness, the others being $1\frac{1}{4}$ millimetres thick. The other three lamps contained each a carbon rod 70 millimetres in length, 2 millimetres thick, and also connected with the main current. The first experiment consisted in burning a carbon rod in contact with the atmosphere, the rod being consumed in a few minutes. The current was then turned on to the thicker rod in each of the six lamps, and a brilliant and steady light was produced, which improved as the current was increased in intensity. The reason for lighting the thicker rod first was that it might consume the oxygen in the lamp, by which the rod was reduced a quarter of a millimetre, and was thus brought down to the gauge of the second rod. The current was then directed through the second rod with equally satisfactory results in all the six lamps. The three lamps with the longer carbon rods were then lighted and successfully exhibited, changes being frequently made from the six to the three lamps and back again. The apparatus used for producing the current was Gramme's magneto-electric machine. With the machine running at about 200 revolutions per minute a moderate light was obtained, which was greatly improved at 300 revolutions, the *maximum* of intensity being obtained at 450 revolutions. The strength of the light depends upon three things—the power of the machine and the number of its revolutions, on the length and thickness of the carbon rods, and on the quality of

the carbon. The experiments showed that with the same strength of current and the same number of revolutions, double the amount of light was obtained with the three long carbon rods as compared with the six short ones. The experiments demonstrated satisfactorily the fact that the electric current could be sub-divided, and hence, if practice confirms experiment, which it is believed it will, there is a wide field open for the application of Kosloff's system. The form of lamp used by the inventor is experimental, and its variation does not affect the principle. He leaves it to mechanical science to devise a lamp which shall meet the varied requirements of light-houses, mines, submarine works, railways and other purposes, to which it was the general opinion of those present on Tuesday the principle is thoroughly applicable.—*Telegraphic Journal*.

ELECTRICAL FIGURES UPON CONDUCTORS.

M. Schneebeli has investigated the conditions on which depend the dimensions of Kundt's electrical figures, which result from the adherence of a fine isolating powder on a metallic conductor, from which a discharge is emitted. In the experiments, the discharge of a Leyden jar took place between a horizontal metallic plate sprinkled with lycopodium and an electrode in the form of a ball or cone above the plate. It was found that, the circumstances being equal, the diameter of the figure augmented with the distance from the electrode to the plate, but never in a constant ratio. The size of the figure augments also with the quantity of electricity which produces it. When the electrode is composed of a certain number of points, a regular circular figure is formed beneath each one. If in the path of the discharge a small plate of glass be introduced, a space clear of powder appears on the metal plate of exactly the form of the glass plate interposed. With electrodes of conical form, presenting an angle of 60° or 30°, it is stated that the electrical figure is larger as the angle at the summit of the cone is smaller. Finally, the diameter of the electrical figure is larger when the discharge takes place in a rarefied gas than at normal atmospheric pressure.

ON CHANGE IN PITCH OF TONES THROUGH MOVEMENT OF THE SOURCE OF SOUND, AND DETERMINATION, BY THIS MEANS, OF THE VELOCITY OF SOUND.—*Dr Schümgel*.—The author experimented with two tuning forks, No. 1 giving 512, and No. 2 508 vibrations in a second. Sounded together they gave four beats in a second. But suppose No. 2 moved towards the observer (situated beside No. 1), its quantity of vibrations will be increased and the number of beats diminished. Dr. Schümgel sought to measure—(1) the time in which a certain number of successive beats was audible; and (2) the velocity of the moved fork. His apparatus (which was electrical) may be briefly described:—A seconds pendulum at each swing closed a circuit, which, through a relay, caused a series of dots to be marked on a telegraph strip at intervals corresponding to seconds. By pressing a key another battery circuit could be closed, which had two effects: part of the current went to the relay, and produced a line in the telegraph paper so long as the key was held down; but the greater part went through an electro-magnet, which attracted an armature at one end of a lever, having at its other end a roller rotated by a cord from a fly-wheel. The roller was thus pressed against the edge of a disc, which, thus set in motion, wound in, by a cord about its axis, a little wagon bearing the tuning fork (No. 2) with its case towards the observer. The method, with some suggested modifications, is commended to the attention of physicists for an accurate determination of the velocity of sound.

TARIFF BUREAU.

SEMI-MONTHLY CIRCULAR.

EXECUTIVE OFFICE,
WESTERN UNION TELEGRAPH COMPANY,
145 BROADWAY, NEW YORK,
June 15, 1874.

To all Offices on W. U. Lines:

The following changes and additions have been made since the date of the last circular:

GENERAL INFORMATION.

Baring Cross, Ark., closed.
Pryor's Station, Ga., closed.
Gridley, Ill., re-opened, square 327.
Garden Plain, Ill., re-opened temporarily, square 346.
Raymond, Ks., closed.
Oakland, Md., closed.
Cohasset, Mass., re-opened.
Delhi, Mich., square 230, is in Washtenaw Co., P. O. A. is Delhi Mills.

The P. O. A. of Dardenne, Mo., is St. Peters.
Gower, Mo., re-opened.
The P. O. A. of Neosho, Mo., is Marling, Newton Co.
The P. O. A. of Wakenda, Mo., Eugene City.
Lone Tree, Neb., is now a W. U. office, square 512, ck direct.
Messages for Manahawkin and Waretown, N. J., will hereafter be mailed from Barnegat, instead of Manchester, as given in tariff book.

Messages taken for Carlstadt, N. J., are delivered from Rutherford Park, N. J., charges for delivery 25 cents.

Messages for the following points may be taken. They should be sent to Penn Yan, N. Y., from which office they will be delivered, charges for delivery 10 cents per message.

Bitter Sweet, N. Y.	Maple Point, N. Y.
Gibson's, "	Oak Lodge, "
Grove Springs, N. Y.	Parker's Wine Cellar, N. Y.
Glen Grove, "	Saints Rest, "
Holmes' Landing, N. Y.	Urbana Wine Cellar, "
Kenka, N. Y.	

Belle Valley, O., closed.
The P. O. A. of Collamer, O., square 169, is Nottingham, Cuyahoga Co.

Gibsonburg, O., closed.
Bryn Mawr, Pa., closed.
Trunkville, Pa., closed.
Pioneer, Pa., closed.
Adams, Tenn., is in square 301, instead of 303, as given in last JOURNAL.

Lanark, Tex., closed.
Mesquite, Tex., closed.
Orwell, Vt., changed to No. Orwell.
Shoreham, Vt., changed to East Shoreham.
Charlestown, Jefferson Co., W. Va., closed.
Tunnelton, W. Va., closed.
Green River, Wy., is now a W. U. office, square 571, check direct.

SUMMER OFFICES RE-OPENED.

46 Cornwall, N. Y.
39 Lake George, N. Y.
* Lake Mohonk, "
47 Ocean Grove, N. J.
The attention of managers is called to the fact that messages addressed, Lake Mohonk, N. Y., or Lake Mohonk House, New Paltz, N. Y., leave "this line at New Paltz." The "tariff for other lines," from the last named office, is 25 and 2.
* Overlook Mountain House, N. Y., tariff 30 and 2 from Rondout.
* Woodstock, N. Y., tariff 30 and 2 from Rondout.
38 Highgate Springs, Vt.
* Rowley Springs, Va., tariff 35 and 6 from Alexandria.
69 Sewall's Point, Va.

NEW OFFICES.

323 Bennett's Sta., Ala.	
* Allen Springs, Cal.,	35 +30 from Colusa.
* Bartlett Springs, Cal.,	35 +30 "
* Leesville, "	50 +25 "
* Williams Ranches, Cal.,	30 +10 "
40 Salisbury, Conn.	
60 Farmington, Del.	
368 Good Hope, Ill.	
347 Smithfield, Ill.	
261 Sheldon, Ind.	
531 Ellinwood, Ks.	
385 Tigerville, La.	
240 Delhi, Ingham Co., Mich.	
269 Fruitport, Mich.	

383 Big Block, Miss.
47 Millham, N. J., check Trenton.
92 Macedon, N. Y.
46 Wappinger's Falls, N. Y.
1 Riversdale, N. S.
1 West River, N. S.
180 Macedonia, O.
94 Dillsburg, Pa.
159 Newport, Lawrence Co., Pa., check Newcastle.
131 Tarr's, Pa., P. O. A. West Bethany.
156 Brunson, S. C.
* Elmo, Tex., 65 5 470 Marshall.
39 East Shoreham, Vt.
39 Lake Dunmore House, Vt., (Summer office.)
39 North Orwell.
366 Victory, Wis.

Messages for Greenpoint, L. I. are frequently checked to Greenport, L. I., by a mistake in reading the name of the office. It is an error too often made by managers and bookkeepers, and one which could be easily prevented by a little more care in keeping the office records.

WILLIAM ORTON, President.

TRANSFER SERVICE.

EXECUTIVE OFFICE,
NEW YORK, June 8th, 1874.

On July 1st, Money Order offices will be established at the following named points:

In S. B. Gifford's District.

Macedon, N. Y.; Fairport, N. Y.

In E. P. Wright's District.

Mt. Vernon, O.

In R. C. Clowry's District.

Los Animas, Col.

In G. T. Williams' District.

Troy, O.

In Leonard Cox's District.

Tarrytown, N. Y.

Attention is called to rule 5, of Instructions to Managers, which provides that the full name and address of the payee of a transfer order shall be inserted in the message, and the full name of the applicant given.

The last clause of this rule is frequently disregarded by managers, the christian name of the applicant (or sender) being omitted from the message.

Transfer agents are directed to require a literal compliance with this rule, hereafter, on the part of their offices. Information of the full name of the sender of a transfer order is frequently of importance in the identification of the payee.

GEO. H. MUMFORD,
Vice-President.

EXECUTIVE OFFICE,
NEW YORK, June 6th, 1874.

TO ALL TRANSFER AGENTS.

From and after the 1st July, 1874, the weekly transfer report to the Treasurer, in its present form, will be discontinued, and in its stead a simple statement of balances will be made up by each Transfer Agent and mailed to the Treasurer at the close of the 7th, 14th, 21st, and last day of each month.

In order to obtain these balances it will be requisite for transfer agents to open a ledger account with each transfer office in their respective districts; an account with "Other Transfer Agents," and an account with "The Treasurer."

Debit each office with—

(1.) The amount of each transfer sent therefrom.

(2.) The amount of cash advanced by the Transfer Agent, or remitted from some other office by his direction.

Credit each office with—

(1.) The amount of each transfer paid there.

(2.) The amount of each transfer refunded there.

(3.) The amount of cash remitted to the Treasurer, the Transfer Agent, or to some other office by his direction.

Debit "Other Transfer Agents," with the transfers originating, and credit them with the transfers paid in other districts.

Debit "The Treasurer" with the amount of cash remittances to him, and credit him with all drafts drawn on him on transfer account.

Example No. 1.

D. H. Bates, transfer agent, receives three transfers; the first from Wilkesbarre, payable at Washington; the second from Baltimore, payable at New York; the third from Chicago, payable at Philadelphia. After sending them forward, he makes the following entries upon his ledger: in the first instance, he debits Wilkesbarre and credits Washington with the amount of the transfer—both offices being in his district. In the second instance, he debits Baltimore and credits "Other Transfer Agents—New York being in another district. And in the third instance, he debits "Other Transfer Agents," (Chicago being in another district,) and credits Philadelphia with the amount of the transfer. The entries should be verified by a comparison with the application and receipt forms, as they are received.

Ledger Entries.

Dr.	WILKESBARRE, PA.	Cr.
July 1, Washington, \$100 |		
Dr.	WASHINGTON, D. C.	Cr.
| July 1, Wilkesbarre, \$100 |		
Dr.	BALTIMORE, MD.	Cr.
July 1, New York, \$100 |		
Dr.	OTHER TRANSFER AGENTS.	Cr.
July 1, Philadelphia, \$100 | July 1, Baltimore, \$100		
Dr.	PHILADELPHIA, PA.	Cr.
| July 1, Chicago, \$100		

Example No. 2.

Mr. Bates receives notice from two offices in his district—Trenton, N. J., and Havre de Grace, Md.—that they have not sufficient funds on hand to meet certain transfers. He thereupon directs Trenton office to draw upon him at sight, for the amount required, and directs Wilmington, Del. office, to remit to Havre de Grace the amount required by the last named office. After which, he debits Trenton and Havre de Grace offices upon the ledger, with the amounts advanced to each; credits himself with the amount of the draft from Trenton, and credits Wilmington office with the amount remitted to Havre de Grace.

Examples Nos. 3 and 4.

C. F. Wood, transfer agent, notifies Mr. Bates that a transfer from Philadelphia to Boston has been canceled; Mr. Bates thereupon directs Philadelphia office to refund the amount, in accordance with rules. After which, he credits Philadelphia office upon his ledger, and debits "Other Transfer Agents" with said amount refunded.

Philadelphia office notifies Mr. Bates that a transfer from Chicago has been canceled; Mr. Bates thereupon notifies Transfer Agent Wilson of the fact, and debits Philadelphia office upon his ledger, and credits "Other Transfer Agents" with said amount refunded.

Example No. 5.

Mr. Bates ascertains, by reference to his ledger, that Harrisburg, Pa. office has received several large transfers, and has, consequently, more money on hand than will be required. He thereupon directs Harrisburg to remit, say, \$300 to the Treasurer, or

to himself, on transfer account. After the remittance has been made, he debits the treasurer or himself, as the case may be, and credits Harrisburg with the amount of such remittance.

The ledger accounts should be kept open until the end of each month, and at the close of the 7th, 14th, 21st, and last day thereof, the Dr. and Cr. balances should be taken off, and a statement of them mailed to the treasurer as directed.

Form No. 52 can be used for this statement, until the supply on hand is exhausted.

The amount of premiums and tolls on transfers may be omitted from the weekly statement, but will be reported to me monthly, upon a special form to be provided for that purpose.

GEO. H. MUMFORD,
Vice-President.

THE TELEGRAPHERS' MUTUAL BENEFIT ASSOCIATION.

ACKNOWLEDGMENT OF RECEIPTS FOR ASSESSMENT NO. 62, UP TO AND INCLUDING JUNE 10TH, 1874.

4, 6, 25, 33, 56, 59, 61, 67, 90, 91, 93, 96, 99, 100, 121, 133, 134, 140, 141, 142, 144, 148, 153, 154, 156, 158, 160, 164, 175, 176, 177, 201, 202, 220, 225, 244, 245, 247, 254, 257, 276, 341, 346, 350, 367, 379, 380, 392, 398, 406, 411, 412, 435, 430, 431, 434, 438, 463, 482, 548, 552, 561, 577, 590, 600, 603, 604, 622, 646, 659, 661, 694, 703, 715, 723, 724, 728, 729, 735, 741, 750, 751, 756, 780, 823, 830, 831, 855, 874, 876, 883, 897, 929, 930, 931, 932, 954, 956, 957, 959, 960, 963, 964, 978, 979, 995, 998, 1023, 1024, 1040, 1046, 1047, 1055, 1072, 1084, 1103, 1139, 1143, 1152, 1173, 1175, 1196, 1198, 1200, 1211, 1213, 1231, 1234, 1235, 1234, 1235, 1248, 1251, 1252, 1259, 1268, 1273, 1290, 1299, 1326, 1339, 1359, 1364, 1365, 1385, 1389, 1390, 1391, 1409, 1440, 1470, 1485, 1517, 1518, 1552, 1555, 1560, 1568, 1582, 1591, 1593, 1594, 1635, 1656, 1658, 1667, 1669, 1672, 1695, 1707, 1718, 1720, 1721, 1723, 1763, 1765, 1766, 1767, 1799, 1790, 1791, 1809, 1811, 1812, 1830, 1831, 1837, 1838, 1847, 1860, 1869, 1874, 1877, 1881, 1906, 1907, 1911, 1913, 1914, 1915, 1938, 1943, 1951, 1957, 1970, 2017, 2021, 2024, 2025, 2027, 2035, 2036, 2044, 2050, 2057, 2065, 2069, 2086, 2089, 2097, 2099, 2106, 2110, 2113, 2116, 2118, 2138, 2142, 2145, 2147, 2156, 2157, 2160, 2162, 2164, 2186, 2191, 2194, 2195, 2203, 2205, 2206, 2206, 2223, 2224, 2225.

ACKNOWLEDGEMENT OF RECEIPTS FOR ASSESSMENT NO. 61, UP TO AND INCLUDING JUNE 10TH, 1874.

31, 42, 76, 84, 154, 156, 158, 160, 164, 176, 177, 201, 202, 206, 247, 252, 312, 316, 341, 350, 411, 412, 418, 441, 442, 532, 556, 557, 566, 584, 590, 597, 642, 646, 648, 655, 659, 694, 701, 703, 710, 712, 717, 723, 724, 728, 735, 741, 730, 731, 732, 733, 735, 736, 790, 802, 819, 815, 823, 836, 838, 841, 842, 897, 904, 906, 916, 926, 929, 930, 931, 932, 944, 954, 956, 957, 959, 960, 963, 964, 979, 980, 998, 1000, 1002, 1014, 1016, 1080, 1081, 1083, 1084, 1041, 1046, 1050, 1067, 1061, 1080, 1105, 1106, 1107, 1108, 1109, 1110, 1112, 1113, 1115, 1117, 1119, 1120, 1121, 1122, 1123, 1133, 1139, 1141, 1152, 1191, 1198, 1211, 1221, 1234, 1235, 1255, 1256, 1268, 1273, 1281, 1283, 1284, 1285, 1286, 1289, 1290, 1289, 1340, 1342, 1344, 1346, 1343, 1349, 1350, 1351, 1352, 1366, 1405, 1409, 1415, 1426, 1427, 1430, 1431, 1432, 1433, 1457, 1458, 1465, 1469, 1470, 1471, 1474, 1475, 1476, 1481, 1485, 1508, 1513, 1528, 1539, 1530, 1552, 1558, 1573, 1586, 1597, 1616, 1649, 1660, 1667, 1673, 1684, 1687, 1688, 1696, 1700, 1701, 1702, 1704, 1709, 1710, 1713, 1724, 1730, 1737, 1746, 1747, 1750, 1751, 1753, 1754, 1755, 1756, 1757, 1758, 1759, 1760, 1765, 1766, 1767, 1768, 1769, 1771, 1785, 1789, 1790, 1813, 1823, 1830, 1837, 1838, 1839, 1840, 1841, 1857, 1859, 1860, 1877, 1889, 1895, 1896, 1897, 1907, 1915, 1958, 1965, 1996, 1997, 2007, 2010, 2012, 2023, 2033, 2041, 2044, 2045, 2074, 2075, 2085, 2089, 2110, 2134, 2145, 2147, 2156, 2157, 2160, 2164, 2171, 2183, 2184, 2185, 2191.

ACKNOWLEDGEMENT OF RECEIPTS FOR ASSESSMENTS 53, 59, & 60, UP TO AND INCLUDING JUNE 10TH, 1874.

51, 169, 182, 423, 429, 490, 495, 496, 497, 499, 500, 503, 504, 505, 506, 507, 508, 652, 660, 684, 916, 929, 934, 1104, 1182, 1269, 1273, 1275, 1289, 1409, 1430, 1495, 1496, 1542, 1552, 1600, 1601, 1603, 1605, 1639, 1641, 1653, 1655, 1657, 1677, 1689, 1690, 1691, 1712, 1743, 1788, 1835, 1907, 1915, 1968, 2105, 2115, 2132, 2146, 2150.

MISCELLANEOUS.

55, 56, & 57.—436, 634, 800, 856, 929, 1430.
55.—1383.
58.—1275.

If G. W. T. will communicate with his friend F. W. D. at Terre Haute, Ind., or with his parents, he will relieve the distress of the latter, as they are exceedingly anxious to hear from him.

RESEARCHES IN ELECTRICITY—A PRACTICAL SUGGESTION.

Sir William Thomson, the eminent scholar, has recently been agitating, before the telegraphic engineers of England, a novel and comprehensive plan for researches in terrestrial electricity. It has now been nearly three centuries since Gilbert, the contemporary of Galileo, declared that the earth itself is a great magnet. But, though laboriously attacked by the astute minds of modern science, the problem he suggested and the numerous kindred inquiries relating to practical matters of terrestrial and atmospheric electricity and the laws of magnetic variation, are as yet in a maze of scientific obscurity. The violent magnetic storms which derange our telegraph wires, as well as the ever-changing secular and annual oscillations of the mariner's needle, are still mysteries and need elucidation. Sir William Thomson, who has had so much experience as the scientific director of the Atlantic cable-laying parties, proposes a simple and inexpensive method of obtaining the electric data requisite for clearing up these mysteries, which now so befog the mariner and the telegrapher.

The first point to be elucidated is the strange secular vibration of the compass. In the middle of the sixteenth century the needle pointed towards the northeast; after a few years it pointed due north; then, till 1820, its direction was west of north, and now it is again returning to the north. It is confidently asserted by electricians that the dip of the needle is, within the next two centuries, to be greater than it has been for a thousand years, or will be for another thousand years. Then the north magnetic pole will lie a little to the west of Spitzbergen, instead of, as now, in Boothia, latitude 78 deg. north, longitude 97 deg. west, where the nodal point is nearly identical with the pole of maximum cold. This shifting of the north magnetic pole is, therefore, over 95 deg. of longitude, or more than one-quarter of the terrestrial parallel. Great as is this variation, necessitating, as it does, a continuous alteration of the magnetic charts, it might be of secondary importance if it stood alone. But it is not the only nor most important perturbation which the needle undergoes. More rapid diurnal and even hourly changes occur, apart from all local causes and apart from all disturbing forces, which sometimes lurk unsuspected on board ships. Between the tropics the hour of the day, we are told by Humboldt, may be quite nicely told by the direction of the needle. There are also localities where the sailor, who has been many days enveloped in mist and denied all means of determining the time, may know from the variations in the inclination of the magnetic needle whether his ship is north or south of the port he is trying to enter.

But the magnetic storm, suddenly bursting on him, may at any time, and in a way not now understood, deflect his mysterious guide and derange all his calculations and courses. The flash of the Northern Light is the signal for still greater disturbances in the directive force, the auroral waves instantly causing violent agitation and forcing the needle to make irregular oscillations on each side of its mean position. During the auroral displays of September, 1859, the agitation extended, as it usually does, over vast sections of the globe where the display itself was not visible. On that occasion, at Toronto, the needle changed three degrees and forty-five minutes in half an hour; the inclination was observed to change nearly three degrees, when it passed beyond the limit of the scale; while, elsewhere, equal or greater perturbations were recorded. These phenomena are

among the greatest mysteries of science; but, if Sir William Thomson's plan of investigation can be carried out, their solution is by no means hopeless. He proposes that practical telegraphers devote a little of their leisure time to simultaneous observations of the earth currents. The one common link connecting the phenomena and bringing them within the scope of observation is the electric telegraph, whether an air line or submarine. And the eminent electrician judiciously recommends the operators to give the matter their study, assuring them that any single observation or series of observations on the electric potentials at one end of an insulated line will give results from which definite answers to the long-mooted questions might be fairly concluded.

It would not be the least of the many great benefits that the electric telegraph has conferred on the world should its practical workman thus utilize its agency for solving the great problems Sir William Thomson has propounded. If abstract science gives so many practical inventions to the arts, we know that the simplest mechanical contrivance has often led the philosopher into new worlds of discovery. There is no reason why, in this case, the electric telegraph should not require fourfold the science which gave it existence. Professor Thomson's appeal suggests a line of profitable occupation for the many active and thoughtful telegraphers in the employ of the large companies.—*N. Y. Herald.*

PHOTOGRAPHY AT THE BOTTOM OF THE SEA.

Dr. Neumayer has recently exhibited before the Berlin Geographical Society a photographic apparatus designed for the determination of the temperature and of the currents at great depths in the ocean.

The invention is composed of a copper box, hermetically sealed and furnished with an exterior appendix made like a rudder. In the interior is a mercury thermometer and a compass, each enclosed in a glass receptacle in which are admitted traces of nitrogen gas. A small electric battery completes the apparatus. When the latter is allowed to descend attached to a sounding line, the action of the current on its rudder causes it to assume a parallel direction, thus indicating the set of the flow by the relative position of compass, needle, and rudder. The thermometer of course shows the surrounding temperature. In order to fix these indications, a piece of photographic paper is suitably disposed near the glass cases containing the instruments. Then at the proper time a current of electricity is established through the gas in the receptacles, causing an intense violet light, capable of acting chemically upon the paper for a sufficient length of time to allow of the photography thereon of the shadows of the compass needle and of the mercury column. Within three minutes, it is said, the operation is complete, when the apparatus is hoisted and the paper removed.

BORN.

HARRAUFF.—At Decatur, Ill., May 29, 1874, to J. B. Harrauff, operator, a son.

STANTON.—At Cromwell, Ct., June 3, 1874, to Lowell L. Stanton, manager C. R. Tel. Office, a son.

MARRIED.

NEAL.—DE WOODY.—At Des Arc, Ark., May 17, 1874, by Rev. Mr. Coleman, A. E. Neal, of the W. U. Tel. Office, De Valls Bluff, Ark., to Miss Addie De Woody, of Des Arc.

DIED.

REYNOLDS.—At De Graff, O., of consumption, L. L. Reynolds, operator C. C. and I. Ry., aged 36 years.

Journal of the Telegraph.

This Journal is issued on the 1st and 15th of each month. Its circulation is over 8,000. It goes to every State, Territory and Province on the Continent. It has become a necessity, and is always welcomed as a friend. No better medium for advertising exists.

TERMS:

TWO DOLLARS PER ANNUM IN ADVANCE.

Address—

JOURNAL OF THE TELEGRAPH,

Western Union Telegraph Company,

145 Broadway, New York.

NEW YORK, JUNE 15, 1874.

TELEGRAPHIC INFORMATION FOR THE PUBLIC.

In course of preparation, soon to be issued, the Western Union Telegraph Company have a work which will prove to be of especial value to the telegraphing public, and of great interest to all classes. It will contain a complete list of telegraph offices in the United States and British Provinces, with the rate to each, the charges to every country in telegraphic connection with the United States, the rules necessary to be conformed to in preparing dispatches and such other information, as will, no doubt, cause it to be in general request.

THE Western Union Telegraph Company are having engraved \$4,500,000 of new bonds. As some misapprehension has existed with respect to the uses for which these bonds were intended, it is proper to state that in a year from next November \$4,500,000 of the Company's bonds will mature. The recent forgeries of Western Union bond certificates had created some uneasiness among the bondholders, and the Company ordered the preparation of a new lot of bonds having twenty years to run, and being exchangeable for the old bonds at the option of the holders. By this measure the old bondholders will be protected by a new and elaborate bond, with every possible protection against fraud, and the debt of the Company will not be increased a dollar.

ARRANGEMENTS have been made between the Western Union and American District Telegraph Companies for a business alliance wherever their systems are to be established in the United States. Offices have been established and maintained upon the principle of mutual interest. Twenty-eight offices are to be established in New York, and others will be opened when the Companies deem it necessary to do so. Five of this number will remain open for business day and night. Six others of the American District Company will be kept open all night, and messages will be transmitted over the Western Union lines, thus making 11 offices altogether constantly open for the transaction of business.

WANTED—A CHARACTER.

In exact proportion to the power we are conscious of possessing over others should be the honor and nobility of its use. Society is so constituted—men are so mutually dependent, that, in the nature of human relations, they become guardians of each other. Wealth and high position sometimes give the idea of independence, but the thought is a misconception and false. Power, of whatever character, only heightens obligation. The more absolute the trust, so must be, if life's grandest duties are not to be ignored, the conscientious, vigorous, honorable use of it. In the study of political economy there is nothing so fundamental as the fact of the intertwining of human interests to such an extent as to become the broadest basis, when appreciated, of not only peace, but of happiness and security and respect. The perception of this is civilization.

Now there is no pursuit in which men engage where all are so mutually dependent as our own. It may not be much thought of, yet is none the less real. There is not an operator, in any office, however obscure, but, at some time or other, has some one's honor in his keeping. We do not refer alone to the knowledge of the contents of messages. That fact is trite. What we now allude to is the power of operators to annoy, deceive, to irritate each other. Take, for illustration, the rule which charges a receiver with error. Does not that rule place every receiver at the mercy of every sender? Is it not well known that it is unsafe to have personal piques existing between men working with each other? It is for this cause we would hustle the man from telegraph circles for ever, who, by cowardly distant abuse, breaks the honorable and fraternal fellowship of the wires. All such abuses of power lead to revenges, and these of a character which may extend the peril far beyond their first victim.

Errors, for which the Company is sometimes sued, and operators dishonored, we more than half suspect are not always errors. By their very peculiarity they seem to us, as we occasionally study them, more of the nature of crimes, either against the Company or companions in labor, and from which both suffer. The suspicion may be false. We cannot help that. What we do know is that the power of operators to annoy and destroy is vast and fearful. It is for this reason that the conviction deepens upon us that a sentiment of honor should mark every man who manipulates a key. The like honorable performance of duty we feel like demanding of every man whose name is on the pay-roll of the service, whatever his position or duties. The more we study its responsibilities, its powers of mischief and wrong, the more we incline to make entrance to the duties of the American Telegraph possible only to men whose characters will bear the alembic of a higher standard than has so far been applied to them.

YOKOHAMA is about to introduce a fire-alarm telegraph.

FORESIGHT.

We learn that the Stockholders of the Atlantic and Pacific Telegraph Company, in Cleveland, have been called upon by the management to "stand by" that Company, and come forward and sign a paper agreeing to hold the stock in their possession for one year. It is stated that many signatures have already been obtained. The officers of the Atlantic and Pacific Company profess that their object is to prevent the Western Union Company from purchasing the stock. As it is well known that the management of the Atlantic and Pacific Company control, in connection with the Union Pacific Railroad, a large majority of the Atlantic and Pacific stock, the simple-minded in Cleveland must suppose that it is only necessary to whisper "Telegraph Stock" to the Western Union Company, to set that corporation to purchasing the same forthwith. The advantage which the Atlantic and Pacific directors will have in disposing of their stock by keeping the country stockholders absolutely out of the market, is, of course, accidental. But if the stock *should* be marked up at the New York Exchange, and if the shares of the officers *should* be sold at a high figure within a year from this time, while the Cleveland stockholders are holding fast to their certificates, the coincidence would be as striking as that narrated by the elder Mr. Weller when "the coach full of woters was upst in the werry identical spot" that had been carelessly mentioned the day before. It is evident that the managers of the Atlantic and Pacific Company were not born yesterday.

A STRIKE OF AMERICAN DISTRICT TELEGRAPH MESSENGERS.

The messenger boys of the American District Telegraph Company are paid \$4 per week for their services in all of the districts, but heretofore while in some districts they were required to devote but eight hours a day to their duties, in others they were on duty ten hours, although receiving the same wages. Last week the company decided to fix the time at ten hours throughout the city. This naturally did not please the eight hour boys, and some twenty of them from the thirty-first district waited upon Vice-President Grant, at No. 62 Broadway, to demand an increase of wages. Three or four of the leaders were discharged on the spot, and the others fined one dollar each for leaving their posts without permission, and this ended the affair.

THE DIRECT UNITED STATES CABLE

The cable steamer *Faraday* has successfully laid that portion of the Direct United States Company's cable between Halifax, N. S., and the coast of New Hampshire. The cable is buoyed about ten miles from land, awaiting the arrival of the steamer *Ambassador*, which left England on June 2d with the shore ends on board. The *Faraday* will proceed to lay the cable remaining on board between Halifax and Newfoundland, and then return to England to load again to lay the cable between Ireland and Halifax.

THE WESTERN UNION DIVIDEND.

REPORT OF PRESIDENT ORTON.

The semi-annual meeting of the Board of Directors of the Western Union Telegraph Company was held in the Executive Offices of the Company in this city on Wednesday, June 3rd.

President Orton called the Board to order and presented the following report and resolutions, which were accepted :

To the Directors : The net profits of the Company for the eight years beginning July 1, 1866, and ending June 30, 1874, those for the present month of June being estimated, are \$23,077,069.23.

Of this sum there has been distributed in dividends to stockholders..... \$4,857,239 24
Disbursed for interest on the Company's bonds... 2,530,749 98

Total..... \$7,387,989 22
The balance, \$15,689,079.91, is represented as follows :
Paid for the construction of new lines and the erection of additional wires..... \$4,920,968 53
Paid for the stock of companies leased to the Western Union, subject to an annual rental.... 700,399 95
Western Union stock (72,877 shares)..... 4,054,493 07
Gold and Stock Telegraph Company's stock (47,710 shares)..... 1,173,500 00
International Ocean Telegraph Company's stock (10,334 shares)..... 961,556 42
Pacific and Atlantic Telegraph stock (56,636 shares)..... 597,585 50
Anglo-American Telegraph stock (\$1,308)..... 10,000 00
Western Electric Manufacturing Co.'s stock, (560 shares)..... 39,000 00
Western Union bonds redeemed and canceled.... 1,063,575 00
Western Union Building, Broadway and Dey st., mortgage sinking fund..... 60,000 00
Real Estate, exclusive of Broadway and Dey street property..... 336,769 86
Patent (the Page and Duplex Telegraph)..... 61,758 00
Cable steamer..... 12,665 19
Western Union bonds, not canceled (\$7,500)..... 6,750 00
Fraction of share, old issue, redeemed and canceled)..... 42 50

Total..... \$13,990,863 02
Leaving a balance of net profits..... 1,698,216 89
Represented as follows :
Cash on hand and due from agents..... 575,000 00
Call loans..... 400,000 00
Advanced on account of the new building, Broadway and Dey street, in excess of the building mortgage bonds..... 300,000 00
Poles, wire and other materials and supplies on hand..... 423,216 89
\$1,698,216 89

Of this sum, \$1,400,000 is the net profit for the six months ending June 30, about \$740,000 being the net profit of April, May and June. This is an increase of more than \$250,000 over the net profits of the same three months last year. In view of the large reduction in rates throughout the South and West which took effect on July 1, 1873, and of the universal depression in most kinds of business which followed the financial panic in September last, such a result is most gratifying, and seems to furnish grounds for the belief that as the general business of the country improves, the receipts and profits of the Company will continue to increase. The Executive Committee have had under consideration for some time past the subject of a disposition of the unappropriated profits above stated. They were at first inclined to recommend a dividend equal to the net earnings of the current six months, which would be about four per cent. on the capital outstanding. To do this, however, would render necessary either the funding of the amounts expended for construction on the new building in excess of the loan made for that purpose, or the sale of a portion of the Company's stock now in the treasury. On mature deliberation it is deemed advisable to do neither, but to

limit the dividend to the profits of the current quarter. This course they have unanimously advised me to recommend to the Board, and in pursuance I submit the following resolutions :

Whereas, The business and financial condition of the Company justify the resumption of regular dividends to the stockholders, which, in the judgment of this Board, should be made quarterly; therefore,

Resolved, That a dividend of 2 per cent. from the net earnings of the three months ending June 30, be and the same is hereby declared payable on the 15th day of July next.

Resolved, That for the purpose of such dividend the stock books be closed at the close of business on the 25th instant, and be opened on the morning of the 16th of July.

CORRESPONDENCE REGARDING GOVERNMENT RATES.

EXECUTIVE OFFICE,
WESTERN UNION TELEGRAPH COMPANY,
NEW YORK, June 9, 1874.

HON. JOHN A. J. CRESWELL,
Postmaster General,
WASHINGTON, D. C.

Sir : Herewith enclosed I send you copy of a message signed "John M. Crowell, Special Agent Post Office Department," desiring to know if, in your opinion, Mr. Crowell is entitled, because of his official position, to send personal and private messages at Government rates.

Permit me also to call attention to the fact that the tariff on the Government line between San Diego, Cal., and its terminus in Arizona, is one dollar, whereas for like distance the rate prescribed by you for Government messages on the Western Union line is seventy-five cents. Should not the Government transmit messages for private parties at the same rates it requires private parties to transmit its own.

I have the honor to be,
With great respect,
Your obedient servant,
(Signed) WILLIAM ORTON,
President.

POST OFFICE DEPARTMENT,
WASHINGTON, D. C., June 10, 1874.

HON. WILLIAM ORTON,
President Western Union Telegraph Company,
NEW YORK, N. Y.

Sir : In answer to your letter of the 9th instant, inquiring whether Mr. John M. Crowell is entitled, by virtue of his official position as a special agent of this Department, to send personal and private messages at Government rates, I have to state that the rates prescribed by me under the Act of July 24, 1866, were intended to apply exclusively to messages on Government business. Messages of a private or personal nature, though sent by persons in official position, are subject to the ordinary rates of pay for communications by telegraph.

As the rates on the Government line between San Diego, Cal., and its terminus in Arizona are not adjusted by this Department, I have no answer to make to your inquiry upon that subject.

Very respectfully,
Your obedient servant,
(Signed) JNO. A. J. CRESWELL,
Postmaster General.

THE Kansas Agricultural College has ten telegraphic instruments and twenty-five cases of type, and these have proved to be the most popular industrial accompaniments of the institution with the students.

THERE are a number of letters lying at the Western Union office at Hearne, Texas, for L. B. Bobo, formerly employed there as operator.

A CRUEL AND HEARTLESS HOAX.

The following, copied from an extra issued by the Glencoe (Pa.), *Register*, is a statement of a cruel and heartless hoax, said to have been perpetrated by a telegraph operator at a distant station. It is hard to believe that a man could be so depraved and so cruel as to knowingly cause innocent people to suffer such mental anguish in the way of a joke. We are glad to learn of his discharge from the service, and hope, if the statement be true, that his punishment will not be thus limited :

"About eleven o'clock to-day the operator at Farmington, Horace Darling, telegraphed Mr. Williamson, the operator at this place, that the train on the H. and D. Railroad, due here at 12:30 P. M., had collided with an extra on the I. and M. Division, by which conductor Vincent was badly mangled and killed outright; engineer Heddy killed by having his head severed from his body; brakeman Fahey and Martin both badly injured, by having ribs broken, &c.; also, that three ladies were killed, and several other passengers seriously injured.

The announcement of the shocking and terrible catastrophe created the greatest sensation ever witnessed in Glencoe. All the parties whose names were given as being among the dead, were well known to the citizens of this place, and highly respected. Strong men shed tears over the sad and sickening details. Several of our citizens were expecting friends on the train. Mr. Williamson was expecting his wife, and his feelings may be imagined when, in answer to his inquiry whether she was among the passengers, the 'fool fiend' inquired of him if she had rings on her fingers, or any other marks by which she could be identified, stating that the killed were so badly mangled that they could not be identified. Mr. Williamson gave the brute a description of his wife, and after three hours of agony, such as a human being could suffer only under such circumstances, the tardy news came that 'fortunately she was not among the passengers,' and finally that it was all a joke; that no one had been injured, though there had been a collision, and the engine on the H. and D. division was crippled.

It is well for that operator that he did not happen to be in this town at the time the dispatch was received saying it was a joke. It would have proved a serious joke for him; and we advise him, wherever else he may go, to go a good ways around Glencoe, unless he wishes to become the occasion of a funeral. If he should live to be as old as Methuselah, and devote the remainder of his life to the performance of kind acts and good deeds, he never could create half as much pleasure as he caused of mental agony to the citizens of this place, during the three or four hours that elapsed between his first despatch, announcing the disaster, and his last, stating that it was a 'joke.'

We cannot conceive of a more wicked and cruel act that a man could be guilty of committing. He deserves to have either fool or fiend, or both, indelibly stamped upon his forehead, and then to be sent so far beyond the borders of civilization that there would be no danger of return. We are glad to know that he has received his discharge. May he never be allowed to touch the wires again."

WE can hardly imagine the possible dignity and value of our lives, unless we consider their probable bearing upon other lives. A word of cheer, an act of passing kindness, a trifling sacrifice, may be just the help required to give vitality and permanence to good resolves which lead to high endeavor and to generous action.

Operators, Attention! BUSINESS AND VISITING CARDS.

Your name beautifully printed on 50 fine Wedding Bristol, for 50c.; Business Cards, 50 for 75c. or \$1.00 per 100; Snow Flake, Marble and Glass Cards, 35c. per doz. Samples 10c. I will allow agents 25 per cent. Fifteen varieties of visiting cards, with agents' outfits for 25c.
Now's your chance. Address to

F. P. MUNN,
Clyde, N. Y., Wayne Co.

ATTENTION, OPERATORS! AMATEUR Telegraphic Instruments, (OR CLICKER SOUNDERS.)

The superiority of our Instruments, and the greatly reduced price at which they are sold, has secured for them a great demand, which increases every day:

Orders are constantly pouring in from all parts of the country; parties having tested the Instruments of our manufacture, and found them highly satisfactory.

Further particulars may be found in the JOURNAL of June 1st, 1874.

PRICES:
Instruments (plain) - - - per half-doz. \$1.00.
" (plated and polished) - - - per half-doz. 1 50.

Postage paid by us in all cases. Address

Mona Manufacturing Co.,
P. O. BOX 178. Newark, N. J.

GO TO HEAD-QUARTERS FOR ALL Telegraph Supplies, AND BUY YOUR INSTRUMENTS AT 20 PER CENT. DISCOUNT FROM LIST PRICE. **L. G. TILLOTSON & CO.,** 8 DEY STREET, NEW YORK.

THE GREAT RUSH at No. 8 DEY STREET is caused in part by the offer of 20 per cent. Discount from list prices on all Telegraph Instruments manufactured by **L. G. TILLOTSON & CO.,** 8 Dey Street, New York.

The "Snapper" Sounder,



TRADE MARK. PATENTED MAY 12th, 1874.

New STYLES. New PRICES.

The unexpected and growing demand for the original "Snapper" Sounder, beyond the expectations of the manufacturers, has delayed the introduction of proposed styles and improvements.

Having increased our facilities and accumulated sufficient stock to enable us to fill orders promptly, the following varieties are now offered for sale at prices which will accommodate all classes.

The "SNAPPER SOUNDER," polished, - - 30c.
or 6 for \$1.50.
Ditto, polished and plated spring, - - 40c.
or 6 for \$2.00.

A few were manufactured to order, with hard rubber knobs. They were so well liked that I have decided to introduce them to the fraternity. The springs are secured by two screws, and in case of breakage may be replaced at an expense of 15 cents. They are thoroughly made and finished.

PRICE 75 CENTS.

A liberal discount to agents.

Canadian customers will please remit 5 cents extra for postage.

R. W. POPE,
Box 5278, N. Y.
SMITH & HALL,
Montreal Tel. Co.,
HAMILTON, ONT., } Agents for Dominion.

Specie Basis reached at last!

We offer 20 per cent. Discount from list price on all Instruments of our manufacture.

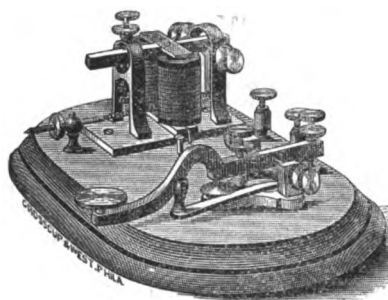
L. G. TILLOTSON & CO.,
8 Dey Street, New York.

Hard Pan Discovered!

L. G. TILLOTSON & CO.,
8 DEY STREET, NEW YORK,

Are offering 20 per cent. Discount from list prices on all Instruments of their manufacture. The quality of the Instruments will be strictly maintained.

**THE PENNSYLVANIA TELEGRAPHIC
AGENCY,
WAVERLY HEIGHTS, PENNSYLVANIA.
PERLESS.**



Nickel Plated.

FULL SIZE RAILROAD SOUNDER AND KEY.

NOTHING MADE OF CAST OR PAINTED IRON. Is finely finished, mounted on Walnut base.

1 cell Calland Battery, office wire, chemicals, copy Smith's Manual, sent C. O. D. \$12 50
If money be sent in advance by registered letter. 12 00
Instruments without Battery. 11 50
Telegraphic and Electrical goods of every description at manufacturers' lowest prices.

Send for Circular.

Red Star Line PHILADELPHIA AND ANTWERP, Appointed to carry the Belgian and United States Mails.

The following Steamers are appointed to sail
FOR ANTWERP.

From Philadelphia.	From New York.	
VADERLAND, June 20.	COLINA, June 6.	
NEDERLAND, July 13.	SWITZERLAND, July 1.	

FROM ANTWERP.

For Philadelphia.	For New York.	
VADERLAND, May 27.	SWITZERLAND, June 10.	
OTSEL, June 24.	COLINA, July 1.	

PRICES OF PASSAGE IN CURRENCY.

First Cabin, - - -	\$90.	Second Cabin, - - -	\$60.
Steerage, - - -			\$25.

Prepaid Certificates, \$25.

Passenger accommodations for all classes unsurpassed. Ample attendance is provided. Every steamer carries a surgeon and stewardess.

Through tickets and through Bills of Lading issued between all prominent points.

For passage, rates of freight, and other information, apply to
PETER WRIGHT & SONS, Gen'l Ag'ts,
307 Walnut Street, Philadelphia, & 42 Broad Street, New York.
B. vonder Becke, General European Agent, Antwerp.

AMERICAN LINE.

The American Steamship Company of Philadelphia.

Weekly Mail Steamship service between

PHILADELPHIA AND LIVERPOOL,

CALLING AT QUEENSTOWN,

Sailing every Thursday from Philadelphia and

Sailing every Wednesday from Liverpool.

The following Steamers are appointed to sail from Philadelphia.

*KENILWORTH, June 11.	PENNSYLVANIA, July 2.
INDIANA, June 18.	ILLINOIS, July 9.
*ABBOTSFORD, June 25.	OHIO, July 16.

PRICES OF PASSAGE IN CURRENCY.

Cabin \$75 to \$100 according to accommodations.	
Intermediate, - - -	\$35.
Steerage, - - -	\$25.

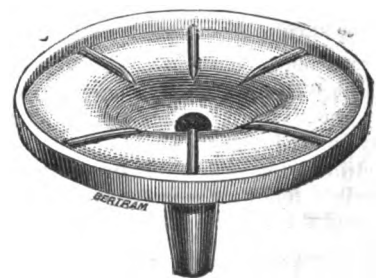
Steamers marked with a star do not carry intermediate. Passenger accommodations for all classes unsurpassed. Ample attendance is provided. Every Steamer carries a surgeon and stewardess.

These Steamers are supplied with Life-Rafts in addition to the usual Life-Boats and Life-Preservers.

Through tickets and through Bills of Lading issued between all prominent points.

For passage, rates of freight and other information apply to
PETER WRIGHT & SONS, General Agents,
307 Walnut Street, Philadelphia, & 42 Broad Street, New York.
Richardson, Spence & Co., N. & J. Cummins & Bros.,
Liverpool. Queenstown.

PATENT BATTERY INSULATOR.



"As near perfect as we can reasonably expect in a contrivance for this purpose."

THE BEST BATTERY INSULATOR IN USE.

OVER 4,000 FURNISHED THE WESTERN UNION TELEGRAPH COMPANY UP TO THIS TIME.

The Montreal Telegraph Company have adopted them, and have 2,500 now in use in their principal offices.

THEY THOROUGHLY INSULATE THE BATTERY,
and save more than their cost.

PRICE 40c. EACH.

Liberal reduction for large quantities.

A VERY SUPERIOR SCREW GLASS INSULATOR CHEAP.

All kinds of Telegraph and Electrical Supplies on hand.

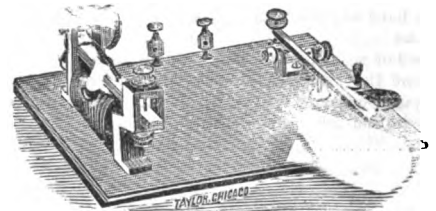
WATTS & CO.,

BALTIMORE, MD.

SEND FOR CATALOGUE.

THE AMATEUR'S Telegraph Apparatus.

(PATENTED APRIL 16TH, 1872.)



With this Instrument is furnished

A Complete Outfit for the Student,

INCLUDING

**BATTERY,
CHEMICALS, and
MANUAL.**

There are several thousand in use.

PRICES.

Complete Outfit	\$7 00
Sounder and Key	6 00
" " with Out-Out and Lightning Arrester	7 00
Sounder No. 3	4 00
" No. 4	3 00
Key No. 4	4 00

GEO. H. BLISS & CO.,

41 THIRD AVENUE,

CHICAGO, ILL.

JOURNAL OF THE TELEGRAPH.

VOL. VII. NO. 13.

NEW YORK, JULY 1, 1874.

WHOLE NO. 160.

CALLAUD BATTERIES.

By F. W. JONES.

As the Callaud battery is fast superseding the Grove and other forms in this country, anything that tends to throw light upon its capacity and render its use more economical and satisfactory may not be out of place in the JOURNAL. Owing to the large size of the cells, and the low electromotive force, as compared with the Grove, it is often a matter of difficulty to provide the necessary space for long rows of Callaud, especially where there are many wires to be supplied. Various writers differ widely in their estimates of the capacity of this battery, some going so far as to say that only two circuits of equal resistance can be worked with economy from the same battery. I have prepared, from actual test, the following table, which gives the percentage of current furnished by a 125-cell Callaud battery to any number of added wires of equal resistance up to number 17, inclusive, taking the strength of current furnished to one wire of 5000 ohms as the basis of the percentage:

No. of Wires of 5000 ohms each.	Joint Resistance. Ohms.	Degrees	Sines.	Percentage of current on each wire.
1	5000	40	.643	100
2	2500	38°	.622	97
3	1666	37	.602	93
4	1250	35°	.580	90
5	1000	34°	.566	88
6	833	33°	.551	85
7	714	32°	.537	83
8	625	31°	.522	81
9	555	30°	.507	78
10	500	29°	.492	76
11	453	29	.485	75
12	415	28°	.472	73
13	383	27°	.461	71
14	355	27	.454	70
15	331	26°	.446	69
16	310	26	.438	68
17	292	25°	.428	66

By the above table it will be seen that seventeen wires can be attached to a battery of the given size, without bringing their joint resistances below the battery's internal resistance, which it is not advisable to do; and by the use of a simple formula it can be ascertained how many cells are necessary in a given battery with several lines attached to make the current in each circuit equal to the quantity that would flow from a given number of cells in a single circuit. Call the number of cells on the single wire A, and the percentage of current in added wires as per table B, then $\frac{A \times 100}{B}$ = the number of cells required.

Suppose A = 100 cells, and 11 wires = 75 per cent current; then we have $100 \times 100 \div 75 = 133$, which would give the same effect on each of 11 wires that 100 cells gave on one wire.

If only 4 wires were attached to a battery of 100 cells, to work 12 wires would require 300 cells and only 90 per cent. of the current that would flow on

one wire alone would be found on each of the four. If 12 wires were worked from one battery, one hundred cells of which gave 100 per cent. on one wire, then $\frac{100}{.66} = 152$, the number of cells necessary to give 100 per cent. to each of the twelve circuits; a saving of space over the four wire method of 163 cells, a gain of 10 per cent. current in each circuit, a reduction in first cost of battery plant, with only a slight increase of attention from the battery man. A great advantage gained by working the battery well up to the limit of its capacity is in the more distinct separation of the solutions by the greater energy caused in the cells by a reduction of outside resistance. It is absolutely necessary to economy that the sulphate of copper solution should never rise to the zinc, nor the sulphate of zinc solution descend to the copper. To make clearer some remarks that follow, I will state the action of a Callaud cell. Water is decomposed; oxide of zinc is formed by the oxygen of the water. The hydrogen passes to the copper, decomposing the sulphate of copper, the sulphuric acid passing to the oxide of zinc, with which it combines and forms sulphate of zinc. The oxide of copper is decomposed, the oxygen and hydrogen forming water, leaving the metallic copper to be precipitated upon the copper plate. The solutions are kept separate by their respective weights, the zinc sulphate being uppermost. In this solution the zinc should entirely reside, as it will reduce copper upon itself if approached by the sulphate of copper solution, thereby destroying the force of the cell by making both plates negative. For a main battery the top of the zinc should be about 1½ inches from top of jar; in a local it must be so regulated that the internal resistance of the cells used shall approximate closely the resistance of the sounder magnets. Should the zinc solution descend to the copper, it will be attacked by the acid of the solution, whereby the copper is consumed and sometimes the connecting wire eaten off. This wire should be attached to the bottom of the copper plate, so that the percha coating may extend as nearly to the bottom of the cell as possible. Sometimes a black powder is deposited by the zinc sulphate stopping the action of the cell.

To preserve the greatest conductivity in the cell the sulphate of zinc solution should be diluted with an equal part of water, and tested occasionally with a hydrometer. When the solution shows 30° it should be reduced to 20° by withdrawing part of it with a syphon and replacing with water. The cost per month for 600 Callaud cells, comprising three batteries working ten circuits of an average resistance of 5,000 ohms is nearly \$30, or 5 cents each, and for 260 local cells, which remain in closed circuit when not being opened by key use, the cost is about 14 cents per cell monthly. Culley gives the following useful test for the purity of sulphate of copper:

"The principal impurity is iron. To detect it, dissolve the crystals in water and add liquid ammonia. This will at first precipitate both the cop-

per and the iron, making the solution appear "cloudy"; but if more ammonia is added the copper "will be redissolved, forming a bright blue solution, while the iron will remain as a brown powder. Good sulphate should contain a mere trace of iron."

As evaporation of water from the cells would necessitate a more frequent filling up; it is a good plan to prevent it by pouring a small quantity of raw linseed oil into each jar, so that a thin film may cover the solution.

In the table given the wires are made equal in resistance, for convenience of calculation, but, practically, it is not necessary to have them equal. The extremes of resistance of circuits attached to one battery must not be too great. Where there are many wires they should be properly classified as to resistance when all relays are in circuit, and such ones as do not widely differ may be placed on one battery, other things of course being equal.

To place beyond doubt the feasibility of working several wires from a Callaud battery, the writer worked for seven days and nights fifteen important railroad and commercial circuits, varying in resistance from 4,000 to 11,000 ohms, from 180 Callaud cells, with fine results. The amount of current given on each current was at least 5 per cent. better than that given by 60 cups Grove, from which these lines were usually worked. At the time the wires were first attached to the battery the sulphate of zinc solution stood at 13 degrees, at the end of several days it stood 15 degrees without any addition of water. At night some of the circuits were reduced one half in resistance by relays being cut out. A prettier Callaud battery could not be found; the sulphate of copper solution never rising over an inch from the copper plate, and as deep and handsome in color as an Italian sky. The material consumed in seven days was 17 lbs. of zinc and 62 lbs. sulphate of copper, which, at market value, equals \$9.20. The cost of 180 Callaud cells working two circuits of about 6,000 ohms during same space of time was about \$2.30. From these figures it is easily calculated which is the more economical. By working down a Callaud cell you accomplish just what is designed by the spiral wire in the Lockwood.

NEW COUPLE PREPARED SPECIALLY for the APPLICATION of CONTINUOUS CURRENTS in THERAPEUTICS.—M. Morin.—The couple is somewhat similar to that of Bunsen; but the central carbon, instead of being in nitric acid, is surrounded by a chromic salt which nearly corresponds, in chemical constitution (water excepted) to the solution of Jacob. It is dissolved by the water bathing the zinc. The advantage of the new process is shown in that, to produce a determinate effect, the apparatus with chromate reaction is reduced to about an eighth of the volume of the sulphate of copper apparatus formerly described by the author, and in which the precipitation of copper is entirely avoided.—Comptes Rendus.

THE MAGNETISATION OF STEEL.

By E. BOUTY.

(1). LET the circuit comprise only a battery of constant current and the magnetising bobbin. Then slowly introduce a recently-tempered steel needle. It acquires a total determined magnetism at the end of a period which appears not to exceed that of its introduction. On slowly withdrawing the needle it is found to retain residual magnetism, which, together with the total magnetism, increases with each repeated introduction until a limit, A , is reached. The value of the magnetic moment, y , at the end of x passages, is sufficiently represented by the empiric formula—

$$y = A - \frac{B}{x} \dots (1)$$

where $A - B$ = the residual magnetic moment after the first passage.

This curious augmentation depends essentially on the intermitting action of the current, since its continuance is ineffectual to produce it. It cannot be attributed to the action of induced currents produced by the needle's entrance and exit, because they are far too weak to modify the magnetisation. It must therefore be admitted that the magnetic equilibrium which succeeds to the current's action modifies the distribution of the magnetism in such a fashion that a second application of the same force, acting under the same conditions, is able to add to the total and residual magnetism.

The needle may be magnetised in the bobbin by three other methods:—

1. **ESTABLISHMENT** (*Etablissement*).—Introduce the needle; establish the current; slowly withdraw the needle.

2. **INTERRUPTION** (*Interruption*).—With a closed circuit introduce the needle slowly, break the current, and withdraw the needle.

3. **INSTANTANEOUS CHARGE** (*Decharge Disruptif*).—Introduce the needle; establish and break the current; withdraw the needle.

Repetitions of either of these three processes (all things being equal) insures an augmentation of the needle's magnetic moment, and its value y is represented by the formula already quoted. It should be, however, remarked that the limit A varies slightly, according to the method employed.

(2). Should the circuit include two bobbins, P and Q , the extra currents complicate the observed phenomena. Let P be much more powerful than Q , and the one placed continuously with the other. Then a needle magnetised by a great number of passages into the bobbin Q , to the corresponding limit, experiences a quick increase by the breakage of the circuit. The increase obtained in P , under similar circumstances, is insignificant. Thus the direct extra current of P is sensible in Q , and *vice versa*; but the extra current of each bobbin has an action which is absolutely exterior to it.

(3). When the circuit comprises two bobbins the slow introduction of a soft iron core into one of them, or its withdrawal, is without appreciable effect on the magnetism of a needle placed in the other. Should, however, such a core be slowly introduced, and sharply withdrawn, the direct induced current augments the magnetic moment of the needle placed in the other bobbin; and repeated insertions and withdrawals very rapidly saturate the needle to the limit y after x passages, which is conveniently represented by—

$$y = A + B(1 - e^{-ax}) \dots (2)$$

where A , B , and a are constants. The results are

the same when the circuit includes an electro-magnet whose armature is brusquely broken away.

(4). With a bichromate of potash battery set up for several days, and consequently presenting the phenomena of the polarisation of the electrodes, and with a single bobbin, the establishment of the current increases the magnetic moment of the needle magnetised by the passages of a quantity of electricity more or less considerable: the current possesses then, at the moment of its closure, a much greater intensity than that which it retains an instant after. When the helix resistance increases the polarisation diminishes, and the characteristic effect of the ESTABLISHMENT tends to disappear.

As to the interruptions, they have not a well-marked effect upon the needles, at least so long as the resistance of the bobbin is not very great. But in that case, in a strongly-magnetised needle, with its south pole to the left of the principal current, one obtains, by the breakage of the current, a diminution of the magnetic moment. The direct extra current of the bobbin, without effect in its interior, augments momentarily the polarisation of the battery, whence is a very sensible depolarising current (immediately after the breakage) which partially demagnetises the needles. Here there is a reflex action.

If the circuit contains a very strong bobbin, A , and a very weak one, B , the direct extra current of A and the reflex action proceeding from the polarisation succeed each other in B , and produce a very odd effect. The interruption of the current greatly augments the magnetic moment of a needle, magnetised to its limit in B ; but the same operation diminishes the moment of a strongly-magnetised needle when placed in B with its south pole to the left of the principal current.

ELECTRICAL EXPERIMENTS WITH AN ENTRANCED SPIRITUALISTIC MEDIUM.

Mr. Cromwell F. Varley, the eminent electrician, writes the following letter to the *London Spiritualist*, as the result of his electrical experiments to detect deception on the part of the medium through whose influence many phenomena have occurred recently in London. The Katie referred to is the spiritual appearance, which has manifested itself at all of the séances recently held for the purpose of allowing scientific investigations to be made as to the truth or falsity of these appearances, and to the part therein taken by the medium, a Miss Cook:

"The experiments in question were made at the house of Mr. J. C. Luxmoore, J. P., 18 Gloucester square, Hyde Park, W. The back drawingroom was separated from the front by a thick curtain, to exclude the light of the front room from the back room, which was used as a dark cabinet. The doors of the dark room were locked, and the room searched before the séance began. The front room was illuminated by a shaded paraffine lamp turned low. The galvanometer used in the experiment was placed on the mantelpiece ten or twelve feet from the curtains. The following observers were present: Mr. Luxmoore, Mr. William Crookes, F. R. S., Mrs. Crookes, Mrs. Cook, Mr. G. R. Tapp, Mr. Harrison, and myself. Mr. Crookes sat close to the curtain on one side, and Mr. Luxmoore on the other.

Miss Cook was placed in an arm chair, in the room which was subsequently to serve as a darkened cabinet. Two sovereigns, to which platinum wires had been soldered, were attached one to each of her arms a little above her wrists, by means of elastic rings. Between the sovereigns and the skin, three layers of thick white blotting paper, moistened with solution of nitrate of ammonia, were placed. The

platinum wires were attached to her arms, and led up to her shoulders, so as to allow of the free movement of her limbs. To each platinum wire was attached a thin cotton covered copper wire, which led into the light room, where the sitters were to be located. Thick curtains separated the two rooms, so as to leave Miss Cook in the dark when the curtains were down.

The conducting wires were connected with the two cells of a Daniells battery, and a regular cable-testing apparatus. When all was ready the back room was darkened, the current passing through the body of the medium the whole evening.

The batteries had been newly charged, and by tests made before and after the séance, they were found not to have varied more than one per cent. The current through the medium diminished gradually, excepting at certain times stated further on, in consequence of the drying of the blotting paper, which increased the resistance between the sovereigns and the skin.

Mr. W. H. Harrison, who was present, recorded the readings and my remarks, and timed them with a chronometer, as I, from time to time, dictated. The current from the two cells flowed through the galvanometer, the resistance coils, and Miss Cook, then back to the battery. The electrical resistance of the body of the medium produced 220 divisions on the scale of the reflecting galvanometer at seven o'clock, and when the two sovereigns were united, it gave a deflection of 300 divisions. The blotting paper dried gradually, and at 7:17 P. M. the deflection had fallen to 107 divisions.

Prior to the medium being entranced, she was requested to move her hands about, which, by varying the amount of metallic surface in actual contact with the paper and skin, produced deflections of from 15 to 30 divisions, and sometimes more; consequently, if, during the séance, she moved her hands at all, the fact was instantly rendered visible by the galvanometer. In fact, Miss Cook took the place of a telegraph cable, under electrical test.

In the course of the evening, the following readings were obtained and remarks recorded. The current was not interrupted an instant during the whole séance. Had the circuit been broken for only one-tenth of a second, the galvanometer would have moved over 200 divisions.

I was placed at the end of the table, ten or eleven feet from the curtain, and only once was I allowed to go nearer, viz., a minute or two before the séance was over.

Our room was dimly illuminated, my eyes were rendered less sensitive than those of the other observers, because I was, for the greater part of the time, closely watching the bright reflected image from the galvanometer; but when I looked at Katie the lamp was for a few moments turned up, to let me have a better view. Katie was much like the medium, Miss Cook, and I said to her, "You look exactly like your medium." She said, "Yeth, yeth!" I was therefore very anxious to see it, when she moved her hands and arms, any variation took place in the strength of the electric current. Sometimes there was a variation; at others, viz., when she opened and closed her fist, and also when she was writing, there was no variation.

Toward the close of the séance the room was darkened, and Katie allowed me to approach her. She then let me grasp her hand; it was a long one very cold and clammy. A minute or two afterwards, Katie told me to go in the dark chamber to detain Miss Cook. I found her in a deep trance, huddled together in her easy chair, her head lying upon her left shoulder, her right hand hanging down. Her hand was small, warm and dry, and not long, cold and clammy like Katie's.

In the course of two or three minutes she came out of the trance, when Messrs. Luxmoore and Crookes came in with a light.

The sovereigns, blotting paper, and wires were exactly as I had left them, viz., attached to her arms by pieces of elastic.

I was so much exhausted after this séance that I was obliged to discontinue the experiments. [I have lent my apparatus to Mr. Crookes, and have been to his house and tested the apparatus before Mr. Crookes, using his son (who is not a medium) in place of Miss Cook who was not present.]

Mr. Crookes is unaffected by physical séances, but I always am very much exhausted by them. Notwithstanding so much vital power is taken from me, my presence very often weakens or altogether stops the production of the phenomena.

The following table gives the readings and the phenomena as they were noted down:

Battery power two cells Daniells; resistance about four Ohms per cell.

Resistance of Galvanometer..... 39,000 Ohms.

" " Coils..... 10,000 "

Total resistance before the medium was put in circuit..... 49,000 "

TABLE.

Battery through 49,000 Ohms pronounced on the Galvanometer 300 divisions on the scale; when Miss Cook in circuit also. 220.

Time.	Deflection.	Remarks.
P. M.		
7.10	220	{ Miss Cook in circuit, 28,000 Ohms when wrists and fists moved.
	200 to 250	
7.12	230	— Séance beginning.
7.13	220	— The medium has shifted her position.
7.14	210	
7.15	220	
7.16	200	— Ditto. Ditto.
	197	
	197	
	195	
	196	
	195	
7.18	194	
	195	
	194	
	195	
	198	
7.19	196	
	195	
	193	
7.20	191	
	190	
	189	
7.21	191	
	191	
7.22	192	{ Katie whispered, her voice being recognized by Mr. and Mrs. Crookes, Mr. Luxmoore, Mrs. Cook, Mr. Harrison and Mr. Tapp.
	192	
	198	
7.23	191 to 195	{ Fluctuating. Medium apparently uneasy, and moving about.
	193	
	192	
7.24	193	
	189	
7.25	191	
	186	
	176	
	174	{ A fall of 36 divisions in one minute. Miss Cook has evidently shifted her position, and has probably moved the sovereigns a little in so doing. No break of circuit, however. See note A.
	171	
7.26	155	
	155	
	151	
7.27	148	
	153	{ Katie looked out from under the curtain on the side next to Mr. Luxmoore, who was on her left; this movement on her part required a motion of her hands. Galvanometer moved five divisions.
7.28	151	
	154	
	157	
7.29	155	{ Katie showed herself again as before for a few seconds, lifting curtain as before. Galvanometer did not move more than three divisions.
	154	
	156	— Ditto. Ditto.
7.29½	154	— Ditto. Ditto.
	153	
7.30	157	
	154	{ Katie showed her hands, I did not see them, all the others did; I was too far away and watching Galvanometer.
7.31	155	— Showed herself again for a moment.
7.32	152	
7.33	152	
7.34	151	
7.35	152	
7.36	135	{ Katie showed her hand and arm. Galvanometer fell seventeen divisions!!
		Note B.
7.36½	150	{ Katie showed both arms, which she freely moved about. Galvanometer rose 15, then 6, in all 21 divisions!!
7.37	156	
	156	
	155	
	157	
7.38	155 to 157	{ Katie appeared on the other side of the curtain close to Mr. Crookes. Showed both of her arms. I saw this.
	157	
7.39	155	{ Katie put her hand on Mr. Crooke's head, who said it felt cold. I saw this. No movement of Galvanometer. Excellent test. Note C.
7.40	156	
7.41	156	
	155	

Time.	Deflection.	Remarks.
7.42	157	{ Katie put her hands out full length, and asked for pencil and paper. Katie now began writing in sight of observers. I watched Galvanometer closely the whole time she was writing, and it did not vary one division. EXCELLENT TEST. After the manifestation, Katie threw the paper at Mrs. Cook (the medium's mother). Katie then at my request moved her wrists, opened and closed her fingers, but the Galvanometer was steady the whole time. I was watching the Galvanometer while asking the questions, and Crookes and Harrison, and others, told me that she moved her hands again and again in the manner requested by me. While Katie was moving her wrists about and opening and closing her fingers, we all distinctly heard Miss Cook moaning like a person in a troubled dream. The opening and closing of her fingers did not cause any variation exceeding one division on the scale; had it been Miss Cook's hand, the Galvanometer would have varied at least 10 divisions.
7.43	156	
7.44	158	
7.45	148	
7.46	149	
	150	
7.47	147	
	150	
7.48	146	{ I here tested the sensitiveness of Galvanometer, and found that with 49,000 Ohms resistance, the deflection was 297½ as against 300 degs. at the commencement of the experiment.

At 7.48, Katie let me grasp her hand, and asked me to wake up the medium.

Note A.—(7.25 to 7.26 P. M.)—Galvanometer rapidly fell from 191 to 155; in another minute Katie appeared; the galvanometer never rose higher than 157 or 158 after this sudden drop. (This is worthy of careful note.)

Note B.—(7.35 to 7.36½ P. M.)—Galvanometer fell from 152 to 135, and rose again to 150; and at 7.37 to 156. The medium seems to have moved much. Here Katie showed both her arms, and moved them freely about. This looked very suspicious; but

Note C.—At 7.39 P. M., Katie moved her arms about freely, and touched Mr. Crookes on the head, the galvanometer being quite steady; it did not vary more than one division; this neutralizes the doubt just expressed.

At 7.42, she was actively writing, but the galvanometer did not vary one division. This, I maintain, clearly proves that Miss Cook was not only in the dark chamber while Katie was in sight, but also perfectly quiescent.

At 7.45 P. M., she repeated this experiment with the same result; and while Katie was moving her fingers and wrists I watched her, Mr. Harrison watching the galvanometer. Mr. Crookes drew our attention to the fact that Miss Cook was moaning like a person suffering from an uneasy dream, and Katie was at the same time standing before us, and moving her hands as desired.

C. F. VARLEY.

NOTE ON MAGNETISM.—*M. Trece.*—The author had formerly called attention to the magnetic movement produced by magnetization. In the heel of an electro-magnet, induction currents were obtained, the direction of which varied with that of the inducing current; this he attributes to the action of a magnetic intermolecular movement exchanged between the poles. Prosecuting the study, he took a long iron bar, one end of which had a strong inducing bobbin, while an induced bobbin could be slid along; and he has examined the conditions in which the magnetic movement is propagated, and observed, *e. g.*, the very rapid decrease of intensity of induced currents generated from the same inducing force, in proportion to the withdrawal of the induced from the inducing bobbin, as also the influence of the section of the bar on the intensity of these currents. What he thinks the most useful result is the ascertaining of a notable retardation of the induced currents (or "*d'arrives*") or the inducing currents (or "*de depart*"); that is to say, that the magnetic movement is slow relatively to the electric movement. He proposes to try and measure the velocity of propagation of this kind of movement.

THE MAGNETIC EQUIVALENT OF HEAT.

There has recently been devised, by M. Cazin, in France, a thermomagnetic differential apparatus, by means of which, it is stated, the absolute quantity of heat engendered by magnetism may be measured; in other words, the magnetic equivalent of heat may by its aid be determined. The investigator, after observing the thermic effects of magnetism on the core of a rectilinear electromagnet, around which the wire is rolled in alternately opposite directions, so as to produce several poles, enunciates the following law: "When the alternate spirals, constructed by the wire, have the same dimensions, and when they divide the magnet into several equal portions (*concamérations*), the quantities of heat created in the iron core at the opening of the voltaic circuit are inversely proportional to the squares of the number of divisions, the other circumstances not changing." For example, four similar bobbins are disposed around a cylindrical iron tube at equal distances apart, the tube extending a short length beyond the outer coils. In establishing the communications, there is obtained, with the same total length of wire and the same total number of points, one, two, or four divisions; the quantities of heat decrease as the numbers, $\frac{1}{4}$, $\frac{1}{9}$.

In order to measure this heat, M. Cazin has constructed a kind of differential air thermometer, in which air reservoirs are used. Two or three thousand interruptions of the electric current produce, with an ordinary battery, a calorific effect very plainly measurable. By dividing the pressure observed by the number of interruptions, and making a small correction analogous to that employed in calorimetry in taking account of the cooling action of adjacent bodies, the thermic effect of the magnetism is obtained.

ON A NEW RELATIONSHIP BETWEEN HEAT AND STATIC ELECTRICITY.—*Mr. A. W. Bickerton.*—The author thinks the relationship, pointed out by Dr. Guthrie, may be explained by the assumption that currents of air, passing over an electrified body, carry off its electricity. Several experiments are adduced. Cold air discharged against a Peltier's electrometer does not take away its electricity, but hot air does. Again, in a glass jar were inserted a platinum spiral, at the upper part, a thermometer, with bulb a little below spiral, and a brass knob (connected with electroscope) two inches below the bulb. The spiral being kept white-hot, the thermometer showed a rise of 1° when the ball was not electrified, and 5° when it was, indicating a downward current of hot air on the ball. Smoke being introduced, there was a downward rush of it, from spiral to ball, on electrifying the latter. Again, the heated wire has no power to discharge (the ball) through rock salt. An induction current gives a much larger spark when the electrodes are heated, and it was proved that this lengthening could not be due to rarefaction of the air. From experiments by Faraday, Dr. Guthrie, and himself, the author concludes: 1. That at low temperatures — electricity is taken away most easily — at high temperatures + electricity, while at certain temperatures both electricities are carried off with equal facility. 2. That high-tension electricity can be conveyed away at low temperatures, and, as the tension gets lower and lower, it requires the air to be of higher and higher temperatures to carry it off.

THE invention of Bells is attributed to Paulinus, Bishop of Nola, in Campania, about the year 400. They were originally introduced into churches as a defence against thunder and lightning.

CORRESPONDENCE.

To the Editor of the Journal of the Telegraph:

I am glad to see the matter of "Profanity on the Wires" touched upon by you, in your editorial columns in your issue of May 1st. As far as this circuit is concerned, the assertion of your correspondent would be no stretch of the truth. There is too much vulgarity, indecency, and profanity by many of the older operators, and that, too, by men who, in conversation, when you meet them, would be ashamed to use such language. I trust the day may come when all improper language may be excluded from the wires, by a high moral sense of the operators themselves.

I trust you will continue to exert the good influence which has for some time back emanated from your excellent JOURNAL, amongst the telegraphic fraternity.

N. OLDFIELD.

To the Editor of the Journal of the Telegraph:

I notice on page 137, JOURNAL May 1st, the suggestion that operators should be compelled to write plainly.

This is a good suggestion. It is a sad fact that many operators who rank as first-class for speed in sending, and accuracy and speed in receiving, write a system of their own, and when they first start in on a new circuit, the best receivers have to learn their alphabet before they can take them. All such little eccentricities as "p" for "is," and "H" for "y," (and "y" for "H," to make it average). Superintendents are not careful enough in selecting managers who are to be entrusted with the supervision of students. An operator who cannot make every letter and figure correctly every time, is not fit to have a student under him.

I think that so soon as a local superintendent or manager sees that a student will persist in making the characters wrong, and will not, or cannot reform the habit, such student should be forbidden the office and be black-listed. We have enough abortions now.

In regard to profanity, I think your correspondent (whom you answer in JOURNAL of May 1st), must live in a wild country, and know but little about first-class circuits. Out here in Missouri we very seldom hear an oath on any circuit, and there are many roads where profanity costs the operator his place. I tell you telegraphy is "way ahead" of any other class of business in this regard. I should like to see the practical results of the very many admirable suggestions that have been made regarding new rules. Can we not have the book soon?

T. U. V.

To the Editor of the Journal of the Telegraph:

Will you please do me the kindness to answer the following questions through the JOURNAL? 1. Will the working of a local out of a main battery (Callaud), having an extra copper sheet and wire attached, interfere with the working, or diminish to any extent the strength of the current on the line? 2. Also, in places where we are troubled in dry weather (in sandy soil) to secure a good ground connection for the Battery, would it increase the strength of the current in the line to plant, at sufficient depth to get good moisture, two or more ground wires, and attach to the Battery? 3. Also, tell us which is the positive and which is the negative poles of the battery? 4. Are there any lines worked both ways at the same time? 5. Can a line be worked with batteries at each end, with both positives or negatives, leading off on the line with

two ground wires at each end and two sets of instruments in circuit at each end?

ENQUIRER.

Answer.—1. Such an arrangement would probably not perceptibly diminish the main line current, but nothing is to be gained by it.

2. Yes.

3. The copper is the positive pole; the zinc the negative.

4. Yes.

5. Yes, if the instruments are properly constructed for duplex working.

To the Editor of the Journal of the Telegraph:

If Mr. A. comes into my office and enquires if I received a message for Mr. B., a few days previous (which had been received and delivered promptly), was it right for to inform him or not? Please answer through your columns, and oblige

J. R. S.

Answer.—Such information should not be given.

To the Editor of the Journal of the Telegraph:

Please let me know how many words in the following message, as this office and a "large city" office differ:

"To Oliver Woodward, Jr., clerk and M.

NASHVILLE, TENN.

What bank in Memphis will pay my draft on you for three hundred and twenty dollars? Answer immediately.

(Signed)

JAMES B. LONG,

Tax Collector."

Your early answer will oblige,

E. P. RUSSELL, Opr.

Answer.—There are twenty words. The two words after the signature should be counted.

To the Editor of the Journal of the Telegraph:

If a person holding D. H. pass for this line, offers a message to a point on another company's line, can it be sent D. H. if he pays other line charges; if so, please give form of check.

H. J. B.

Answer.—Yes. See reply to "An Op'r," JOURNAL, September 15, 1873.

To the Editor of the Journal of the Telegraph:

If the sender of a half rate message desires to change a message after it has been filed a half an hour or so, can he do so?

If he should change his mind and not want it sent at all, would it be proper to return the message and the amount of tolls collected on it? It being understood, of course, that the message was in the office where it was filed, and had not been transmitted at all.

"RUX."

Answer.—To both questions, yes.

To the Editor of the Journal of the Telegraph:

I get error sheets and other matter very frequently which require an answer by mail. Should I pay for stamps out of my own pocket or charge to company? This seems to be very trifling, but it amounts to a great deal in a year.

WM.

Answer.—The postage stamps required in conducting the service should be charged to the company in your monthly account.

To the Editor of the Journal of the Telegraph:

In having an extra key connected with the local battery and sounder, does it interfere with the main writing, by opening key on local circuit? Please answer through the JOURNAL.

S. M. H.

Answer.—It would not interfere with the course of the current upon the main line, but in opening the circuit of the local battery, of course the action of the sounder would be stopped.

STANHOPE, N. J., June 10, 1874.

To the Editor of the Journal of the Telegraph:

Can you inform me through your valuable paper how the magnetic needle has been pointing for the last ten years, and what is the official record of its changes, and where shall I refer to for such a record for a greater number of years, say twenty or thirty?

OPERATOR.

Answer.—In 1820 the magnetic needle pointed west of north. It is now returning to the north. You may be able to obtain the official record from the Smithsonian Institute at Washington, or the Greenwich Observatory at London.

To the Editor of the Journal of the Telegraph:

Has party who holds a D. H. pass over W. U. lines, a right to instruct an agent of same company under which he holds his pass, to telegraph him every day, and several times each day, collect, and then have them made D. H. or returned, as the message should be free for pass, the agent (party No. 2) having no pass? Please answer in JOURNAL.

X. Y. Z.

Answer.—No. He has no such right. Messages addressed to a person known to hold a frank should never be taken collect, unless they are answers to messages signed by him.

BOSTON, June 4, 1874

To the Editor of the Journal of the Telegraph:

Will you please inform the writer through the columns of the JOURNAL whether there has been a wire invented on which a message can be sent from each end at the same time; if such a wire has been experimented with, and if such, who the inventor; success or failure attending the trial.

JOSEPHUS.

Answer.—We know of no such invention. It is probable, however, that experiments in that direction are being made.

To the Editor of the Journal of the Telegraph:

Please answer, in your next issue, the following questions: 1st. What is the largest salary paid to operators in the United States? 2nd. Where is the greatest demand for operators? 3d. What is the fastest receiving on record, and by whom was it received?

M. H.

Answer.—1 and 2. Cannot inform you. 3. See JOURNAL of April 15th, 1873.

To the Editor of the Journal of the Telegraph:

A responsible party sends a message "collect," guaranteeing payment. The receiving office reports the party addressed cannot be found. The sender is promptly notified and requested to pay for the message. Word is returned by the sender that the party is well known at place and claims that proper search has not been made and requests another effort be made, and if not found, then to drop in post-office, and he will then pay charges. This, he is informed, cannot be done, according to the new rules of the company, unless paid for by him. He then refuses to pay for the original message. What should be done in such a case, and is the manager responsible for the tolls on such a message?

MANAGER.

Answer.—We see no other way than to return the message with your account as uncollectible; but no more messages should be transmitted for that party unless prepaid. Your superintendent should be informed of the facts that he may prevent a recurrence at any other office.

To the Editor of the Journal of the Telegraph:

A difference of opinion having arisen here between two offices in regard to counting a Government Message, I submit the question to you for your decision:

The signature, "W. M. Dunn, Jr.," was checked as three words by the sending office, which the receiving office refused to take unless "Jr." was counted as a distinct word, making it four.

I claim there are but three words in it according to rules and general usage, and that government messages are counted the same as ordinary messages, with the exception, of course, that the address and signature of a "Govt." is counted with the body of the message.

Am I correct?

M. M. J.

Answer.—In Government messages every word is counted, consequently the word Junior, or its abbreviation, Jr., is a word as much as any other part of the name.

To the Editor of the Journal of the Telegraph:

Rule No. 1, reads as follows: "A competent person to receive messages from the public must be in attendance at seven o'clock, A. M., from March until November, and as early as 7½ o'clock during the winter."

I think there is room for improvement in this rule. What is meant by a "competent person?" Does it mean an operator, or a clerk, or both?

Answer.—A competent person in this reading, is a person sufficiently qualified to receive messages from the public. He may be an operator, or clerk, or both.

TELEGRAPH SECURITIES IN LONDON.

Mr. Wm. Abbott, of London, in his Monthly Circular, has the following in regard to telegraph securities:—"There has been an increased amount of business in this market during the past month, and at one period prices were buoyant. Anglo-American Stock and West India and Panama Ten per Cent. Preference Shares advancing to £76 and £114 'buyers' respectively. A relapse has, however, taken place in the former, owing to the action of the Canadian Government, which has sanctioned and referred to the Home Government a bill bearing upon the rights and privileges of telegraph companies. It is impossible to say at present what will be the actual result of this bill as affecting the existing telegraph system. It is more than probable that in some quarters, for speculative purposes, the very worst construction has been placed upon the intentions of the Canadian Legislature. Holders of Anglo-American stock may, however, I think, safely await the decision of the English Government, which, after the scrupulous regard it showed to the English telegraph holders, will not now, for the first time in its history, be a party to any measure having the semblance of spoliation against an undertaking which has expended so large an amount of its capital on the faith of existing laws and concessions. While so much is being said against monopolies granted to submarine telegraph companies, it may be as well to mention that these special privileges were originally indispensable, and constituted the first conditions which impelled the pioneers in Atlantic cable enterprise to subscribe the requisite funds for what was then, in the minds of the majority of people, almost as wild a scheme as would have been a proposal for electrical communication with the moon. The early struggles of the Anglo-American Company may now, perhaps, be half forgotten, but the great services of the company in the work of progress and civilization will surely at least save it from confiscation.

"The traffic returns of the Eastern and Eastern Extension Telegraph Companies begin to show noticeable increases, which are all the more satisfactory, seeing that they occur at a time when the commerce of the several countries served by those lines is in a very inactive state. These improved receipts are no doubt evidences of the progressive growth of telegraphic business. Formerly, numbers of our Eastern merchants made use of these lines, perhaps only once a week, whereas now many of the principal firms are gradually recognizing the fact that bi-weekly, and, in some instances, almost daily messages are indispensable to the perfect management of their respective operations. When one calls to mind the remarkable development of telegraphy at home, such as that which occurred from 1862 to 1866, when the total number of messages transmitted by the Electric and Intercolonial Telegraph Company alone advanced from 1,534,590 in the former to 3,150,149 in the latter year, holders of Submarine Cable Shares may rest satisfied that they have an improving property."

CUBA SUBMARINE CABLE.—The report of the directors states that the cost of the expedition to repair the cable was very large, being £20,500, and in addition to this six months traffic was lost, which may be estimated at £12,000 or £13,000. As the old cable is reported to be not in a very sound condition, to prevent a future interruption in the traffic, the directors now propose to lay a duplicate cable from Santiago de Cuba to Cienfuegos, a distance of 400 miles; which additional accommodation has been greatly needed for some time past in consequence of the largely increasing traffic. To pay for the cable and other expenses the directors propose to issue 6,000 shares of £10 each, bearing a cumulative preference dividend of 10 per cent. convertible into ordinary shares. This proposed expenditure would also place the company in the most favourable position for treating with its powerful neighbors for the lease of its cables at a fixed rate, or for making any other arrangements the shareholders may think proper.

A PROSPECTUS has been issued in London of the Black Sea Telegraph Company with a capital of £130,000 in shares of £10 each, of which 10,000 shares are for subscription. The company have acquired exclusive concessions for thirty years from the Emperor of Russia and the Sultan of Turkey, for establishing a submarine telegraph between Odessa and Constantinople, which, besides affording telegraphic facilities for the trade of the Black Sea and Sea of Azof, will, by means of the system of the Eastern Telegraph Company which now extends to Constantinople, complete a telegraph route to foreign countries for every part of Russia. The Telegraph Construction Company have contracted to lay the cable early next month for £97,000 in cash, and £30,000 in full paid shares. The President of the Great Northern Telegraph Company is chairman.

THE French Government, according to the *London Times*, with a view to obtain a reduction of rates for telegraphic despatches to the east, has granted a concession to the Anglo-French combination of capitalists for the exclusive right to lay cables between the south coast of France and the eastern shores of the Mediterranean, with special privileges for the direct and uninterrupted transmission of messages from England, through France to the east. The concession further grants a reduction of one half of the ordinary rates over the French telegraphic system.

THE New South Wales Government has arranged with Queensland and New Zealand to get a cable laid from Singapore to the Queensland coast, and will ask Parliament to sanction it before the session closes.

A DIVIDEND of 7½ per cent. was declared May 20th, at the meeting of the Reuter Telegraph Company, making, with the interim dividend of 2½ per cent. in October, a total distribution during the year of 10 per cent.

THE increase in the export of telegraphic wire and apparatus from Great Britain was remarkable in the last four months compared with the preceding year. The sums were respectively £429,643 and £122,099.

DR. MAREY'S CHRONOGRAPH.

The use of the tuning fork for the measurement of very short intervals of time presents certain advantages which have led to its extended employment in recent chronographic apparatus. A new instrument of this description has been brought out by Dr. Marey, which is an improvement on a device of M. Mercadier, or rather is an attachment to the latter for the purpose of insuring greater accuracy. M. Mercadier's invention consists of a tuning fork horizontally placed. One branch is attracted by an electro-magnet. Its movement toward the core, however, breaks the current, causing the arms to spring back. This phenomenon is repeated indefinitely, throwing the branch into very rapid vibrations, each of which causes the contact of a platinum wire with a small platinum disk communicating with the battery. Suitable registering devices were connected with this instrument which it is unnecessary here to describe, as Dr. Marey found that its employment was frequently difficult on account of the extremely small amplitude of the vibrations. In order to remedy this defect, the above inventor places, in the circuit of the electro-magnet of the tuning fork, a second electro-magnet which naturally becomes magnetised or demagnetised coincidentally with the first. The second coil has a single bobbin, and attracts its armature a hundred times per second. The armature moves in a plane parallel to the polar face, and is carried by a spring. In order to obtain an absolute unison between the two vibrations, the spring is regulated to proper length by means of a delicate screw. The armature being attracted laterally, its sudden stoppage is avoided, and a much larger amplitude is obtained; and by means of a piece of quill, forming a prolongation, it traces curves corresponding to hundredths of seconds on a blackened surface. The electro-magnet is carried in a handle through which passes the conducting wires establishing the communication with the battery and tuning fork. These wires, which for convenience are united in a single cord, may be of suitable length to allow of using the instrument in any portion, for instance, of a room.

If it be desired to measure the exact period of revolution of a pulley and its variations of velocity during its rotation, the face of the wheel is covered with lampblack, and the quill point of the chronograph brought in contact therewith. The tracing will show the angular movement during each one hundredth of a second, enabling the builder, for example, of a machine requiring delicacy of construction, to detect errors which otherwise might escape his notice. By the same means, suitably arranged, Dr. Marey is enabled to govern the movement of an escapement, and hence to regulate accurately the operation of a train of wheels, an application of value in telegraphic instruments.

TARIFF BUREAU.

SEMI-MONTHLY CIRCULAR.

EXECUTIVE OFFICE,
WESTERN UNION TELEGRAPH COMPANY,
145 BROADWAY, NEW YORK,
July 1, 1874.

To all Offices on W. U. Lines:

The following changes and additions have been made since the date of the last circular:

GENERAL INFORMATION.

Oxford, Ala., closed.
Fresno, Cal., is now a W. U. office.
Steel's Mills, Ill., closed.
Young America, Ill., changed to Kirkwood.
The P. O. A. of Enfield, Iowa, is Strawberry Point. Messages addressed to Strawberry Point should be sent and checked to Enfield.
Business for Freeport, Me., will hereafter be checked direct.
Mackinaw City, Mich., re-opened, square 127.
Sidney, Neb., is now a W. U. office, square 538, check direct.
Business for Weirs, N. H., (Summer office,) will hereafter be checked to Lake Village.
There is no office at Fanwood, N. J. Messages for that place are delivered from Plainfield, N. J., at a charge for delivery of one dollar. Check business to Plainfield.
Etna, N. Y., is now a W. U. office, square 88, check direct.
McLean, N. Y., is now a W. U. office, square 83, check direct.
Middlefield, N. Y., re-opened.
The P. O. A. of Prospect, Chautauqua Co., N. Y., is Prospect Station, Chautauqua Co.
The P. O. A. of Fairview, Harrison Co., Ohio, is Jewett.
Bryn Mawr, Pa., re-opened.
Indian Creek, Pa., closed.
Jacob's Creek, Pa., closed.
West Alexander, Pa., closed.
Darby, Pa., closed. Messages delivered from Philadelphia. Charges for delivery \$1.50 per message.
Oakwood, Texas, re-opened, square 480.
The office given as Mesquez, Tex., closed, in JOURNAL of June 1, should read Marquez.
Rockfish, Va., closed.
Evanston, Wy., is now a W. U. office, square 574, check direct.
Rawlins, Wy., is now a W. U. office, square 564, check direct.

SUMMER OFFICES RE-OPENED.

* Seaview House, W. Haven, Conn., 25 and 2 from New Haven.
67 Kirkwood, Del.
17 Old Orchard Beach, Me.
21 Pigeon Cove, Mass.
47 Deal, N. J.
27 Bethlehem, N. H.
17 Bear's Head, Hampton Beach, N. H.
27 Crawford House, N. H.
27 Fabyan House, "
17 Farragut House, "
27 Glen House, "
27 Mt. Washington, N. H., check Glen House.
27 Mt. Washington Depot, N. H., check Fabyan House.
27 Profile House, N. H.
27 Twin Mountain House, N. H.
17 Seaview House, Rye Beach, N. H.
27 Waumbeck House, N. H.
Messages addressed to Rye Beach, N. H., should be checked to Farragut House.
74 Chittanooga Springs, N. Y.
88 Crystal Springs, "
40 Lebanon Springs, "
57 Trenton Falls, "
108 Jordon's White Sulphur Springs, Va.
143 Montgomery White Sulphur Springs, Va.
108 Berkeley Springs, W. Va.
The tariff to or from above-named "Summer offices," in N. H., in square 27, is 20 cents more than the usual square rate.

NEW OFFICES.

Batavia, Cal.
Soledad, Cal.
546 Bijou, Col.
29 Noank, Conn.
388 Elkhart, Ill.
397 Kirkwood, Ill., (formerly Young America.)
307 Mt. Clare, Ill.
261 Roann, Ind.
16 Madison, Me.
311 Ida, Mich.
261 Litchfield, Mich.
48 Munising, "
48 Onota, "

Half-rate messages will not be taken for, or received from Munising and Onota, Mich.

384 Carter's Hill, Miss.
446 Oregon, Mo.
3 Rockland, N. B.
41 Franklin, Essex Co., N. J.
83 Breesport, N. Y.
83 Erin, "
* Lyons Falls, N. Y., 30 2 57 Utica.
83 Watkins Glen, N. Y., (Summer office.)
181 Moore's, Pa., P. O. A. Yohoghaney.
131 St. Vincent's College, Pa.

* McArthur, Ohio, { 95 6 233 Cincinnati.
75 5 213 Chillicothe.
85 5 181 Marietta,
* Centredale, R. I., 15 2 25 Providence.
* Pascoag, " 25 2 25 "

Customers offering messages for points in Idaho, Montana, and New Mexico, should be informed that the lines to the territories named, although in the care of the government, are not always in repair, and that messages for them are accepted only at sender's risks.

ATLANTIC CABLE BUSINESS.

We are notified that direct telegraph communication is now established between London and the following points:

Tariff in addition to the rate for For 30 words
10 words to London. or less.
Madeira, (Madeira Islands,) \$5.80
St. Vincent, (Cape Verde Islands,) 14.38
Pernambuco, (South America,) 30.50
Bahia and Para, " 41.50
Rio de Janeiro, " 46.50
Santos, Santa Catarina, and Rio Grande do Sol, (South America,) 52.25

Half rate for each additional 10 words or fraction of 10 words. Messages for Montevideo, South America, will be posted from Rio de Janeiro. Postage 37 cents.

Messages destined for Buenos Ayres and Chili, should be addressed care "Oldham Montevideo." The charges on such messages as far as Montevideo must be prepaid. The charges beyond Montevideo will be collected from the receiver.

WILLIAM ORTON, President.

TRANSFER SERVICE.

EXECUTIVE OFFICE.
NEW YORK, June 25th, 1874.

On July 1st, Marion, Ala., will be discontinued as a money order office.

GEO. H. MUMFORD,
Vice-President.

EXECUTIVE OFFICE,
NEW YORK, June 30, 1874.

On July 1st Money Order Offices will be established at the following named points in D. H. Bates' district:

Cape May City, N. J.
Atlantic City, N. J.

GEO. H. MUMFORD,
Vice-President.

THE TELEGRAPHERS' MUTUAL BENEFIT ASSOCIATION.

Assessments Nos. 63, 64 and 65, issued June 25, 1874.

DEATH OF MARCELLUS C. HART, A. R. WALSH AND T. W. PRIEST.

Marcellus C. Hart, (Certificate No. 996, issued Oct., 1870,) died at Callinsville, Ill., April 21, 1874, of consumption.

Anthony R. Walsh, (Certificate No. 2,079, issued July 8, 1873,) died at Louisville, Ky., May 3d. Mr. Walsh, in a temporary fit of insanity, threw himself from an upper window of the Galt House, Louisville.

Thurlow W. Priest, (Certificate No. 1,730, issued December 21, 1872,) died at Kalamazoo, May 9th, of epilepsy.

Members holding certificates numbered up to and including No. 2,250 will remit for above Assessments. Those numbered from 2,251 to 2,260, inclusive, will remit for Nos. 64 and 65. No. 2,262 should remit for No. 65.

The following is a brief statement of the membership and finances of the Association, on June 15, 1874:

Members admitted since Nov. 5th, 1873.....	118
Memberships canceled since Nov. 5th, 1873.....	133
Number of Members in good standing, June 15, 1874.....	1,204
Number of Deaths since Nov. 5th, 1873.....	11
Balance on hand Nov. 5th, 1873.....	\$8,456 15
Collected on Assessments to date, including amount received for No. 62, and paid in advance since Nov. 5th, 1873.....	15,423 00
Applications.....	172 50
do for restoration under resolution passed at last annual meeting.....	50 00
Gift.....	1 00
Interest on deposits to January 1, 1874.....	228 05
do do January 1 to July 1, 1874 (estimated).....	240 00
Total.....	\$24,570 70

Amount paid to

Heirs of T. Wilcox, (assessment 44).....	\$1,229 00
E. Wade, do.....	45 1,217 00
R. S. Fowler, do.....	46 1,230 00
W. P. Trites, do.....	47 954 00
J. A. Conley, do.....	48 1,178 00
M. H. Bacon, do.....	49 1,135 00
E. S. Keep, do.....	50 1,130 00
A. Saville, do.....	51 1,115 00
C. W. Hills, do.....	52 1,112 00
C. McCarthy, do.....	53 1,013 00
J. M. Worden, do.....	54 1,000 00
F. E. Curtis, do.....	55 1,000 00
G. M. Simmons, do.....	56 1,000 00
S. Porter, do.....	59 1,000 00
G. H. Everett, do.....	60 1,000 00
Due heirs of W. H. Kelly, do.....	57 1,000 00
do C. P. Rosser, do.....	58 1,000 00
do E. P. Reardon, do.....	61 1,000 00
Advance assessments, including No. 62.....	832 00
Salary of Secretary and Expenses.....	597 53
Total.....	\$20,742 53
Reserve Fund.....	\$3,828 17
Total.....	\$24,570 70

It will be seen that the reserve fund is now \$3,828.17, requiring only \$172.00 more to enable the Association to meet an Assessment without calling on the members.

The initiation fee of \$1.50, increased by the increase in the reserve fund to \$2.50, is now \$3.50.

Agents and members should take notice of this fact, so as to be able to inform applicants for membership.

ACKNOWLEDGMENT OF RECEIPTS FOR ASSESSMENT NO. 62, UP TO AND INCLUDING JUNE 23, 1874.

5, 13, 26, 31, 53, 55, 70, 72, 76, 80, 84, 89, 97, 101, 108, 114, 126, 139, 146, 171, 178, 181, 183, 189, 190, 191, 193, 197, 198, 206, 218, 227, 230, 240, 252, 271, 280, 312, 316, 319, 323, 328, 353, 357, 362, 364, 366, 371, 376, 382, 402, 414, 418, 441, 456, 466, 468, 469, 470, 471, 475, 476, 484, 511, 512, 514, 516, 554, 555, 556, 557, 560, 565, 569, 573, 574, 575, 584, 586, 594, 642, 648, 655, 662, 663, 664, 665, 669, 670, 690, 701, 710, 712, 722, 730, 733, 753, 772, 781, 782, 783, 785, 786, 787, 802, 803, 808, 809, 830, 836, 838, 841, 842, 848, 870, 871, 886, 901, 904, 905, 906, 916, 922, 926, 927, 938, 939, 942, 943, 944, 949, 980, 1000, 1002, 1014, 1016, 1026, 1030, 1031, 1033, 1034, 1041, 1050, 1057, 1058, 1063, 1074, 1075, 1076, 1080, 1085, 1098, 1099, 1100, 1101, 1102, 1105, 1106, 1107, 1108, 1109, 1110, 1112, 1113, 1115, 1117, 1119, 1120, 1121, 1122, 1123, 1131, 1141, 1144, 1149, 1164, 1187, 1190, 1191, 1193, 1194, 1238, 1237, 1233, 1237, 1238, 1240, 1241, 1245, 1255, 1256, 1270, 1277, 1281, 1282, 1283, 1284, 1285, 1286, 1288, 1289, 1294, 1304, 1307, 1308, 1309, 1311, 1312, 1313, 1314, 1315, 1317, 1318, 1319, 1390, 1391, 1392, 1396, 1399, 1340, 1342, 1344, 1346, 1348, 1349, 1350, 1351, 1352, 1353, 1354, 1355, 1356, 1366, 1371, 1372, 1375, 1376, 1398, 1403, 1406, 1415, 1417, 1418, 1427, 1428, 1430, 1431, 1432, 1433, 1437, 1438, 1448, 1449, 1457, 1458, 1465, 1469, 1471, 1474, 1475, 1476, 1481, 1483, 1490, 1497, 1498, 1500, 1501, 1503, 1506, 1508, 1513, 1515, 1522, 1528, 1529, 1530, 1532, 1546, 1558, 1559, 1572, 1573, 1576, 1580, 1586, 1596, 1597, 1608, 1604, 1605, 1607, 1608, 1616, 1619, 1620, 1626, 1631, 1639, 1649, 1650, 1652, 1653, 1655, 1660, 1661, 1662, 1663, 1665, 1666, 1673, 1678, 1681, 1682, 1684, 1687, 1688, 1692, 1699, 1700, 1701, 1702, 1704, 1709, 1710, 1713, 1714, 1723, 1724, 1732, 1733, 1737, 1745, 1746, 1747, 1750, 1751, 1753, 1754, 1755, 1756, 1757, 1758, 1759, 1760, 1768, 1769, 1771, 1773, 1775, 1785, 1794, 1795, 1796, 1797, 1799, 1804, 1804, 1807, 1813, 1815, 1817, 1822, 1824, 1828, 1835, 1839, 1840, 1841, 1844, 1845, 1852, 1857, 1858, 1859, 1863, 1864, 1889, 1895, 1896, 1897, 1916, 1917, 1921, 1923, 1924, 1926, 1931, 1942, 1964, 1965, 1969, 1978, 1983, 1986, 1987, 1991, 1992, 1993, 1994, 1996, 1997, 2007, 2010, 2012, 2015, 2016, 2020, 2023, 2033, 2041, 2045, 2053, 2060, 2061, 2073, 2074, 2075,

TESTS OF INSULATION.

Made from Little Rock, Arkansas.

2084, 2085, 2092, 2094, 2098, 2101, 2108, 2109, 2114, 2119, 2120, 2123, 2125, 2130, 2131, 2134, 2136, 2141, 2155, 2159, 2165, 2166, 2167, 2170, 2171, 2180, 2183, 2184, 2185, 2198, 2199, 2207, 2209, 2210, 2214, 2217, 2226, 2227.

ASSESSMENTS NOS. 63, 64 AND 65.

4, 21, 131, 188, 208, 277, 286, 289, 464, 564, 626, 722, 742, 858, 859, 923, 932, 1357, 1490, 1516, 1662, 2197.

ASSESSMENT NO. 61.

5, 51, 178, 185, 186, 187, 271, 319, 466, 468, 469, 470, 471, 475, 14, 516, 560, 653, 685, 697, 705, 801, 943, 1026, 1063, 1071, 1187, 1371, 1400, 1449, 1497, 1504, 1532, 1556, 1557, 1570, 1603, 1604, 1605, 1607, 1608, 1613, 1620, 1639, 1653, 1655, 1670, 1680, 1691, 1692, 1699, 1741, 1745, 1758, 1799, 1807, 1833, 1923, 1924, 1926, 1945, 1946, 1917, 1978, 1994, 2015, 2064, 2109, 2141, 2151, 2165, 2170, 2192.

ASSESSMENTS NOS. 58, 59 AND 60.

271, 288, 1086, 1207, 1604, 1607, 1608, 1609, 1692, 1699, 1798, 1934, 1978, 2128.

ASSESSMENTS NOS. 55, 56 AND 57.

1798, 1883, 1934.

MISCELLANEOUS.

58.—19, 800, 1933.
59.—19, 800, 1933.
63.—64, 414, 509, 825, 912, 916, 917, 1169, 1178, 1678, 2196, 2301, 2321, 2323, 2327, 2342, 2351, 2352, 2353, 2354, 2355, 2356, 2357, 2358, 2359, 2360.
64.—64, 509, 912, 917, 1178, 2337, 2361, 2362.
65.—2361.

ADVANTAGES OF THE TELEGRAPH IN WAR.

A very little study of the wars of the French Revolution, in comparison with those of our own time, will be sufficient to show what an advantage the telegraph is to the modern commander. A striking instance of the extreme difficulty of combining the operations of separate corps or armies in the same theatre of war, without the aid of the telegraph, is afforded by the history of the campaign of 1796, in Germany, when Moreau and Jourdan were "acting in concert" against the Austrians. The Archduke Charles left a weak retarding force in front of Moreau, while he directed all his available strength against Jourdan; and the former general was actually advancing in triumph through Southern Germany, under the full conviction that his colleague had obtained a like success to the northward, while the latter had actually been defeated at Amberg, Wurtzburg, and Aschaffenburg, and driven back upon the Rhine, and Moreau only heard of his disaster in time to save his army from destruction by a hurried retreat through the defiles of the Black Forest. As a contrast to this, let us take the campaign of 1866, when the two Prussian armies advanced from separate bases into Bohemia, laying down the lines of the field telegraph as they moved forward, which, being connected by the permanent telegraphic system of Saxony, kept each army in constant communication with each other, and thus enabled them to combine their operations, and at length to unite with decisive effect on the battlefield of Sadowa.—A. H. ATTERIDGE, in *Popular Science Monthly* for July.

INTERNATIONAL TELEGRAPHIC CONFERENCE.

The London *Post* of 23d ult. says an international conference will assemble at St. Petersburg in 1875, for the purpose of revising the rules and regulations adopted by the Paris Convention of 1865, for the government of telegraphic lines.

Some twenty-two States are expected to be represented by delegates.

BORN.

DOWNER.—At Chico, Cal., June 13, 1874, to John A. Downer, Manager W. U. Telegraph office, a son.

SPILLMAN.—At Mt. Morris, Mich., June 11, 1874, to T. L. Spellman, Agent and Operator F. & P. M. Ry., a son.

MARRIED.

HOLMES—ABBOT.—June 17th, 1874, at the residence of the bride's parents, by Rev. A. B. Maxwell, Bradner P. Holmes, Manager W. U. Telegraph office, to Miss Fannie A. Abbott, all of Leontia, O.

Date.	Line.	Station Tested With.	Number of Miles.	INSULATION RESISTANCE.		Kinds of Insulation.	Weather.
				Reading.	Average Per Mile.		
1874.							
Feb. 27.	No. 1 South,	Texarkana,	144	46,400	6,681,600	Glass,	Raining.
	" 2 "	"	144	49,000	7,056,000	Kenosha,	"
Feb. 28.	" 1 "	"	144	19,000	2,736,000	Glass,	"
	" 1 "	"	144	17,000	2,448,000	"	"
	" 2 "	"	144	16,000	2,304,000	Kenosha,	"
	" 1 "	"	144	34,700	4,996,800	Glass,	Clearing.
	" 2 "	"	144	29,000	4,176,000	Kenosha,	"
	" 4 St. Louis.	St. Louis,	345	44,000	15,180,000	Glass,	"
	" 1 Memphis.	Memphis,	142	7,060	1,006,780	"	Raining.
	Jacksonport,	Jacksonport,	99	14,500	1,435,500	"	"
Mar. 1.	No. 1 South,	Texarkana,	144	1,111,000	159,984,000	"	Cloudy.
	" 2 "	"	144	1,111,000	159,984,000	Kenosha,	"
Mar. 2.	" 1 "	"	144	1,111,000	159,984,000	Glass,	Clearing.
	" 2 "	"	144	1,111,000	159,984,000	Kenosha,	"
Mar. 3.	" 1 & 2 looped,	"	288	1,111,000	159,984,000	"	"
	" 1 South,	"	144	46,000	6,624,000	Glass,	Slight rain.
	" 2 "	"	144	33,000	4,752,000	Kenosha,	"
	" 1 Memphis,	Forest City,	100	400,000	40,000,000	Glass,	"
	" 4 St. Louis,	Swiftson,	100	404,000	40,400,000	"	"
	" 2 Memphis,	Memphis,	142	101,000	14,342,000	"	"
Mar. 9.	" 1 South,	Arkadelphia,	65	1,111,000	72,215,000	"	Slight rain.
	" 2 "	"	65	1,111,000	72,215,000	Kenosha,	"
	Jacksonport,	Jacksonport,	99	1,111,000	109,989,000	Glass,	"
	No. 1 South,	Texarkana,	144	1,111,000	159,984,000	"	"
Mar. 10.	" 2 "	"	144	1,111,000	159,984,000	Kenosha,	"
	" 1 "	"	144	13,300	1,915,000	"	Raining.
	" 1 Memphis,	Memphis,	142	49,300	7,099,200	Glass,	"
Mar. 12.	" 1 South,	Texarkana,	144	15,600	2,215,200	"	"
	" 2 "	"	144	411,000	59,184,000	Kenosha,	Clear.
	" 1 & 2 looped,	"	288	61,000	8,784,000	"	"
Mar. 13.	" 2 South,	"	288	61,000	8,784,000	Kenosha,	"
Mar. 14.	" 3 St. Louis,	St. Louis,	345	107,000	15,408,000	Glass,	"
	" 4 "	"	345	704,000	242,880,000	Kenosha,	Cloudy.
	" 1 Memphis,	Memphis,	142	1,111,000	383,295,000	"	"
	" 1 South,	Texarkana,	144	Infinity,	"	"	"
	" 2 "	"	144	1,111,000	159,984,000	"	"
	" 1 "	"	144	1,111,000	159,984,000	Kenosha,	"
	" 2 "	"	144	404,000	58,176,000	Glass,	Raining.
Mar. 15.	" 1 "	"	144	1,111,000	159,984,000	Kenosha,	"
	" 2 "	Arkadelphia,	65	164,000	10,660,000	"	"
	" 1 "	"	65	249,000	16,185,000	Glass,	"
	" 2 "	Texarkana,	144	41,000	5,904,000	Kenosha,	"
	" 1 "	"	144	77,000	11,088,000	Glass,	"
	" 2 "	"	144	71,000	10,224,000	Kenosha,	Cloudy
	" 1 "	"	144	221,000	31,834,000	Glass,	"
Mar. 16.	" 1 & 2 looped,	"	288	52,000	14,976,000	"	"
	" 2 South,	"	144	34,700	4,996,000	Kenosha,	Mist.
Mar. 17.	" 1 "	"	144	1,111,000	159,984,000	Glass,	"
	" 2 "	"	144	1,111,000	159,984,000	Kenosha,	"
Mar. 18.	" 1 "	"	144	56,700	8,164,000	Glass,	"
	" 2 "	Arkadelphia,	65	160,000	10,400,000	Kenosha,	Foggy.
	" 1 "	"	65	1,111,000	72,215,000	Glass,	"
	" 2 "	Texarkana,	144	102,000	14,688,000	Kenosha,	"
Mar. 19.	" 1 "	"	144	909,000	130,896,000	Glass,	"
	" 2 "	"	144	17,000	2,448,000	Kenosha,	Wet.
	" 2 "	Arkadelphia,	65	47,000	3,055,000	"	"
	" 2 "	Malvern,	43	70,000	3,010,000	"	"
	" 2 "	Fulton,	125	54,000	6,750,000	"	"
	" 2 "	Benton,	23	344,000	7,912,000	"	"
Mar. 20.	" 1 "	Texarkana,	144	39,000	5,616,000	Glass,	"
	" 2 "	"	144	60,700	8,740,800	Kenosha,	Clearing.
Mar. 21.	" 1 "	"	144	807,000	116,208,000	Glass,	"
	" 2 "	Malvern,	43	301,000	12,948,000	Kenosha,	Rain.
	" 2 "	Arkadelphia,	65	220,000	14,300,000	"	"
	" 2 "	Texarkana,	144	105,400	15,177,600	"	"
	" 1 "	Arkadelphia,	65	770,000	50,050,000	Glass,	"
Mar. 22.	" 1 "	Texarkana,	144	247,000	35,568,000	"	"
	" 1 Memphis,	Forest City,	100	290,000	29,000,000	"	Damp.
	" 2 "	"	100	220,000	22,000,000	"	"
	Jacksonport,	Jacksonport,	99	159,000	15,741,000	"	"
	No. 4 St. Louis,	St. Louis,	345	1,111,000	383,295,000	"	"
	" 3 "	Newport,	84	Infinity,	"	"	"
	" 2 South,	Texarkana,	144	211,000	30,384,000	Kenosha,	"
Mar. 23.	" 1 "	"	144	1,111,000	159,984,000	Glass,	"
	" 2 "	"	144	210,400	30,297,600	Kenosha,	"
	" 2 "	Benton,	23	1,111,000	25,558,000	"	"
	" 1 "	Texarkana,	144	690,400	99,417,600	Glass,	"

Journal of the Telegraph.

This Journal is issued on the 1st and 15th of each month. Its circulation is over 8,000. It goes to every State, Territory and Province on the Continent. It has become a necessity, and is always welcomed as a friend. No better medium for advertising exists.

TERMS:

TWO DOLLARS PER ANNUM IN ADVANCE.

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JOURNAL OF THE TELEGRAPH,

Western Union Telegraph Company,

145 Broadway, New York.

NEW YORK, JULY 1, 1874.

REPEATING MESSAGES.

There is nothing more desirable, just at this time, when the whole system of telegraphic service and management is under review, than to ascertain the safest and best modes of performing telegraphic work. Here, for example, a most interesting and practical controversy has arisen respecting the safest method in the process of repeating messages. In the absence of positive rules on the subject the practice varies under different managers and in different localities. The plan largely pursued is to have a message, as soon as sent, transmitted back and copied off, as in the case of an original message, compared with the original, and, if correct, affixed thereto and filed away. Others disapprove of this mode as involving unnecessary labor and likely to multiply error, claiming that the true and easiest and most practically perfect method is to listen to the returning message, underlining each word of the original message as its duplicate is received, thus, on the instant, detecting each error made either of spelling or of language, and having it corrected. There are, undoubtedly, other modes in use, where the message is neither copied nor the original underlined. Which of these processes shall the Company adopt in the new code of rules now preparing? Here is a practical question worth solving, for the processes of the Company must be uniform and be the best attainable. We invite a discussion of their merits, and trust to hear from experienced men in such a way as to convince us where excellence lies, and what shall be the authoritative result.

The statement of the financial condition of the Telegraphers' Mutual Benefit Association is very satisfactory. There appears to be nearly four thousand dollars in the treasury in excess of all demands.

J. J. SMITH, operator at Sandy Hook, Md., desires information as to the whereabouts of Fred. K. Gardner, and Frank H. McDonald. They were working at Terrace, Utah, in April, 1871.

PROTECTION AGAINST LIGHTNING.

The interesting article in the JOURNAL of June 15th, showing how easily a grave difficulty can be overcome in the case of the destruction of Duplex machinery by lightning, suggests the enquiry whether, with our present knowledge, lightning should be allowed to be any longer an enemy to the status of our office machinery. It was shown in the JOURNAL of June 1st, that over a wide range of territory, west of the Mississippi, where the ravages of the lightning had been constant and extensive, by the use of very simple appliances these had wholly disappeared. Practically, the magnets of the prairie offices, where the bolts of fire used formerly to play riot, burning them up, and dashing into splinters long segments of lines, are now safer than in the quieter latitudes of the east. If this be so, has not the time come when a burnt magnet should be unknown, and its occurrence the proper subject of an official reprimand? The means of its accomplishment are easy and inexpensive. It should be done outside of all office structures, leaving the office arrester to be a mere subordinate protector. We urge, therefore, the enquiry, and do it earnestly, has not the time come to declare the burning of a relay a proper subject of discipline and reproof?

A QUESTION OF DUTY.

In the new code of rules, under the head of the Delivery Department, the following is one of the rules suggested:

DELIVERY OF IMPORTANT MESSAGES.

"In the case of a message which cannot be delivered because the place of business to which it is directed is closed, the contents of which, nevertheless, are extraordinary, and indicate the importance of a speedy delivery, the Manager of an office may, in his discretion, endeavor to deliver the same at the residence of the party addressed or elsewhere, but, except at the place of original address, to no other than the person addressed, and whose personal receipt therefor must be obtained, unless under written instructions directing delivery in such cases. If delivery is not thus made, the message will be delivered to its original address at the earliest hour practicable. On no account shall duplicates of messages be sent out for delivery."

Criticizing this, the manager of one of our offices writes as follows:

"Think rule 8 wont do. If message addressed to place of business is received after business hours, and we deem it of great importance and therefore send to residence, but when messenger gets there, he is told the party is not at home—is, for instance, spending the evening somewhere, but is expected home in hour or so—are we to so construe this rule, that we would not be allowed to deliver the message to the family or servant of receiver?"

To which we reply, that that is just what it means. We believe that there are some messages, which, if delivered thus, would make some good men prematurely bald; not that we associate lack of hair in any special cases as the result of any such process. To others, it would be the source of very great annoyance. There are a thousand things connected with social and mercantile life, which, however correct

and pure, are strictly personal and honorably so. For this reason, when a message bears a distinct address, it must be delivered nowhere else and to no one, even at his own home, except to the individual himself, unless he chooses, in writing, to permit his telegraphic correspondence to be otherwise treated.

TRYING THE SPIRITS.

No little interest is manifested in England at the present time, in the efforts of Mr. William Crookes, F. R. S., in the investigation of so-called spiritual phenomena from a scientific stand-point. Mr. Crookes is well known to the scientific world as the editor of the London *Quarterly Journal of Science* and also of the *Chemical News*, both high authorities in the sphere to which they belong. In a series of articles in the *Quarterly Journal of Science*, he is giving the results of his investigations, which, however interesting, are hardly proper matter for the columns of the JOURNAL, excepting in the instances where he employed electricity and electrical apparatus to aid him in fathoming the mystery. This he has done to some considerable extent, being aided therein by the skill and ability of Mr. Cromwell F. Varley, the celebrated English electrician, so well and favorably known in America. Mr. Varley has communicated to the London *Spiritualist*, a very full account of one of the tests which he conducted with electrical apparatus, which we transfer to our columns. He seems to have employed every means known to electrical science, and to have taken every possible precaution to detect deception.

THE BRAZILIAN CABLE LAID.

The cable between Portugal and Brazil, via Madeira and the Cape Verde Islands, has been successfully laid, and Brazil is now in telegraphic connection with Europe. The following message was received in London, on June 23d, from Pernambuco, Brazil:

"PERNAMBUCO, June 22, 1874.

"The cable is in perfect order and will be opened to the public for business to-morrow."

The successful completion of this enterprise occasioned much pleasurable excitement throughout Brazil, and on the 23d, there was a general jubilee in Pernambuco.

The usual pleasant messages of congratulation passed between the government of Portugal and Brazil, and on the 25th, the following congratulatory despatches were exchanged between the Emperor of Brazil and President Grant:

TO THE PRESIDENT OF THE UNITED STATES, Washington.

The inauguration of the electric telegraph between Europe and Brazil, which also unites us to the Republic of the United States, is a cheering sign of improved international relations, as also a bond of friendship and a powerful instrument of civilization.

I congratulate my great and good friend the President of the United States upon this happy event.
DOM PEDRO, Rio de Janeiro.

PRESIDENT GRANT'S REPLY.

To this President Grant responded as follows:—

EMPEROR OF BRAZIL, Rio de Janeiro:—

I congratulate you upon the telegraphic connection just established between Brazil and the United States. May it prove as close a link in national friendship as in communication.

U. S. GRANT.

THE NEW CODE OF RULES.

AN EVIL DEMANDING REMEDY.

From San Francisco.

"Here is what comes of bad writing and bad spacing. A cable message was sent to 'Langham London'; it reached New York 'Langhampton Don,' and was sent to Don in France. The error was made on one of our most prominent circuits.

It would seem that there is no reasonable excuse which can be made for such a gross blunder, when, as a rule, all cables are repeated back. In making up the new rules, I think it would be well to make a very strict one covering this important duty. Clear, firm writing and good spacing will avoid many errors. Running words together seems to be a rule rather than an exception among operators now a days, and it should be checked."

From Dunkirk, N. Y.

The proposition to accept no message to send collect unless payment is provided for is correct and necessary. For messages which are not answers there is, of course, but one course to pursue, *i. e.*, to require prepayment or suitable guarantee. But for answers there is a difference of opinion as to the mode of determining whether payment is provided for or not. There are two ways, either of which is safe, so far as collection of tolls is concerned. The question is, which one will be the least oppressive to our patrons and at the same time just towards the company. The plan which the proposed new rules seems to indicate, is to refuse to send collect—without guarantee from the sender—an answer to any message which does not read "reply paid." The other only safe plan is to consider (and hold managers responsible accordingly,) that charges on answers to all messages asking for reply, or which are interrogatory in character are guaranteed by sender of original message, if transmitted within a specified limit of time, unless such original message is accompanied with a signal or words signifying that answer must not be sent collect. It is very rarely the case that a man will not guarantee charges for an answer; therefore it will so seldom be necessary to notify an office that answer must not be sent collect, it will not be burdensome to transmit such notice by signal or words without charge. Of course we could not demand pay for them.

In regard to the other plan. Most people prefer to leave the payment of answers optional with their correspondent—although they will fully guarantee the same—and they will feel it oppressive to be compelled, through risk of having transmission of reply refused, to invite the correspondent to send it collect, and have to pay extra for the invitation.

The rule saying answers *may* be prepaid is all right so far as it goes, but I am thoroughly convinced that instruction should be given that it must not be construed as prohibiting the sending of answers collect in the absence of "reply paid."

I most earnestly recommend the adoption of some rules defining the rights of offices to circuit. A struggle for circuit is always occasioned by some one contending for what he believes to be his right, and so long as operators are left to decide among themselves what those rights are, such struggles will continue, causing ill feeling and detention to business. A few simple rules would remedy this evil, which is of greater extent than executive officers, superintendents, or even circuit managers are aware of. My twenty-five years of experience has shown me that this great evil is mainly due to the bad example, selfishness and unwarrantable assumption of superiority on the part of operators at the terminal stations,

who, almost invariably, are the least experienced and least competent of the force employed at such stations, and are therefore assigned to way circuits. It is hard for way offices to reach the ear of the circuit manager except through these persons, who will give such coloring to any complaint as will clear themselves from blame in his eyes; and he is generally more interested in having the files of his own office kept clear, than in seeing that way offices get a fair chance to do their business promptly. I would therefore suggest that the instruction to report struggling for circuit be not confined to the circuit manager, and that some rules be adopted which will give all a fair show in using crowded circuits. It is quite customary on many circuits to break into the call of an office after two or three signals have been made, and if the operator don't tamely submit to the imposition, fight for circuit with him.

From New Orleans.

Many of the proposed new rules I have long considered as very necessary to the perfection of the service, and some of them have been in practice here for years. For instance, I do not allow any answer to be given as to whether a certain person sent or received a message; and I make it my constant aim to know nothing of the contents of messages, but only to know that they are being sent, received and delivered promptly. This I hold to be the true course, but there are many managers who keep informed, either by personal examination of the records or through their clerks, of all that is passing. This, I have no hesitation in saying, is a grave error, one that is injurious to the service, and the manager who does it makes himself a victim for designing men.

RESPONSIBILITY OF OPERATORS.

The question as to the responsibility of operators is a very serious one, or rather a very difficult one. It is not right that the Company should lose by the carelessness of its employes, and it does not look right that an operator should be compelled to make good the losses in many instances. For instance, when there is large business on the hooks, the lines are working badly, at the close of an arduous day's or night's work, and the man is endeavoring to get the business to its destination, then I think some allowance should be made for human nature. And here I must say that the Company has, in the main, and with some recent exceptions, been lenient in this respect. I keep in my mind that I was an operator once, and this probably makes me look upon errors with indulgence.

Before making any rule fixing their responsibility, all operators should be graded as 1st, 2d or 3d class, and they should not be transferred from one to the other unless upon the written certificate of at least two superintendents with whom a certain period has been passed. It would be difficult to do this with those who learn and become accomplished in one district. I mean it chiefly for those, now unfortunately too many—unfortunate for themselves chiefly, and partly so for the Company—who roam over the lines from year to year and become worthless.

In many instances, and according to rule, the receiving operator has been compelled to pay for errors, when there was reason to believe that the fault was with the sending operator, who was at work for which he was unqualified.

I am averse to making or rather suggesting a rule in this case, but am certain that an operator to whom many errors are traced should be reduced in his class; this probably would produce a better effect than requiring them to pay losses.

In conclusion, I beg to suggest, that in times of

transition or change men are prone to extreme measures, and time and care is necessary to enact a code of rules for so vast and important a service as that in which we have the honor to be engaged.

From Marietta, O.

1. Blank No. 7 should have the words "keep a duplicate of this report in your office," same as No. 14. Many small offices do not book their messages, and, failing to keep a duplicate of the check sheet, No. 7, have to guess at answers to error inquiries.

2. Whether it would not pay the Company in the end to return to the old method of duplicating figures free, is a disputed question. I well remember where a money order for fifteen dollars was received, to read fifty dollars, and the Company lost thirty-five dollars, the parties receiving the amount being irresponsible. Customers will not duplicate figures, and pay for them, without dissatisfaction, and the Company secures a valuable check on the receiver's carelessness by this method. Where a cipher word covers the amount, the word should be duplicated, with a comma between them.

3. The company would undoubtedly save money by some improved method of simplifying the tariff changes. More space should be left in tariff books, and, as has been suggested, some plan adopted whereby extra printed leaves could be added to the book. The Company has no idea how much they lose at small offices, on account of tariff books not being posted up to date, and it is almost impossible to get small offices to do this under the present arrangements.

4. The new rule book should explain fully the present blanks in use, and especially how to make out reports. Superintendents of railroad lines have to copy and correct one-half the reports on a new line, before forwarding them.

5. Each district to be governed by the city time of its headquarters. Time to be given from the superintendent's office every Sunday morning. This makes Sunday hours a necessity, and it is hard to see how this can be avoided.

6. A more liberal policy towards way operators on through circuits made of way wires. I have myself had to hold a death message several hours, while two large cities sent dozens of messages of less importance, as well as held several private conversations, all under the generally accepted rule, that way offices must "scatter," when the "big" offices commence.

From Boston.

When the senders of messages which cannot be delivered, because of a wrong or incomplete address, receive the notice usually given in such cases, they commonly return the notice with a new or amended address, which they expect to be sent free. The following form of notice is suggested to inform parties of the necessity of payment in such cases:

OFFICE OF THE WESTERN UNION TELEGRAPH CO.

—o—
BOSTON,.....187

Sir:
Messenger has been unable to deliver your despatch for.....directed to.....
.....
for want of correct or complete address.

NOTE.

The above notice is given by courtesy, and not from any obligation on the part of this Company. The regular tariff charge will be made for transmission of any duplicate, having corrected, or additional address, or for any message of instructions to the delivery office.

ON THE ACTION OF INCANDESCENT SUBSTANCES ON TRANSMISSION OF ELECTRICITY.—*M. Douliot.*—The difference of action of an incandescent body on the two electricities is not always in the same direction. Carbon and platinum, *e.g.*, act in an opposite manner. The author replaced the ball of an electroscope with a holder containing a small cylinder of lighted charcoal. If a body charged with *positive* electricity is brought near, the gold leaves rapidly diverge till they are discharged by the metallic balls at the sides of the jar; they commence again to diverge, are again discharged and so on. If the electrified body is removed before the leaves have touched the balls, they remain divergent and have positive electricity. The results are quite different when a *negatively* electrified body is brought near the electroscope; in this case the instrument is affected only at a very short distance; the leaves separate less quickly, and they come together promptly when the source of electricity is withdrawn. These results are entirely opposite to those obtained by M. Erman, with Davy's aphlogistic lamp (incandescent platinum wire) on an electroscope; for when the *positive* pole of a dry pile was near to the instrument, there was no effect, whereas, on bringing the negative pole near, the leaves diverged, and remained charged with negative electricity. If one brings a piece of glowing charcoal with the hand to an electroscope charged with negative electricity, no effect is obtained; but if the instrument is charged with *positive* electricity, the leaves fall together almost instantly. We thus see, that if the electricity which is brought to the incandescent part of the charcoal by the induction of that in the electroscope is *negative*, it flows out to bring the electroscope to the natural state; and if, on the contrary, it is *positive* electricity that is attracted, the transmission does not occur. Thus, whatever way the experiment is made, incandescent charcoal allows negative electricity to escape more easily than positive, while previous experiments show that incandescent platinum allows positive electricity to escape more easily than negative.

Operators, Attention! BUSINESS AND VISITING CARDS.

Your name beautifully printed on 50 fine Wedding Bristol, for 50c.; Business Cards, 50 for 75c. or \$1.00 per 100; Snow Flake, Marble and Glass Cards, 35c. per doz. Samples 10c. I will allow agents 25 per cent. Fifteen varieties of visiting cards, with agents' outfits for 25c.

Now's your chance. Address to

F. P. MUNN,
Clyde, N. Y., Wayne Co.

GO TO HEAD-QUARTERS

FOR ALL

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20 PER CENT. DISCOUNT

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The "Snapper" Sounder.



TRADE MARK. PATENTED MAY 12th, 1874.

Polished, 30c., or 6 for \$1.50.

Polished, with nickel-plated spring, 40c., or 6 for \$1.80.

Polished, with knob and screw fastenings, 75c.

PRICE 75 CENTS.

Sent post-paid on receipt of price.

R. W. POPE, Box 5278, N. Y.

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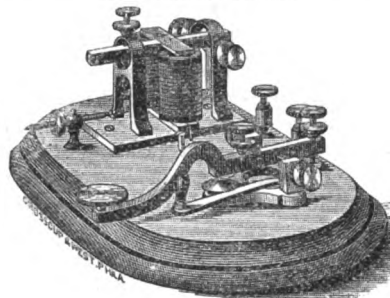
Hard Pan Discovered!

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Are offering 20 per cent. Discount from list prices on all Instruments of their manufacture. The quality of the Instruments will be strictly maintained.

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WAVERLY HEIGHTS, PENNSYLVANIA.
PEERLESS.



Nickel Plated.

FULL SIZE RAILROAD SOUNDER AND KEY.

NOTHING MADE OF CAST OR PAINTED IRON. Is finely finished, mounted on Walnut base.
I sell Callaud Battery, office wire, chemicals, copy Smith's Manual, sent C. O. D. \$12 50
If money be sent in advance by registered letter. 12 00
Instruments without Battery 11 50
Telegraphic and Electrical goods of every description at manufacturers' lowest prices.
Send for Circular.

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The following Steamers are appointed to sail

FOR ANTWERP.

From Philadelphia.	From New York.
NEDERLAND, July 13.	SWITZERLAND, July 1.
CYBELE, July 18.	COLINA, July 25.

FROM ANTWERP.

For Philadelphia.	For New York.
VADERLAND, July 13.	COLINA, July 1.
NEDERLAND, Aug. 6.	SWITZERLAND, July 25.

PRICES OF PASSAGE IN CURRENCY.
First Cabin, - \$90. Second Cabin, - \$60.
Steage and Intermediate tickets to and from all points at the lowest rates.

Passenger accommodations for all classes unsurpassed. Ample attendance is provided. Every steamer carries a surgeon and stewardess.

Through tickets and through Bills of Lading issued between all prominent points.

For passage, rates of freight, and other information, apply to
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PETER WRIGHT & SONS, Gen'l Ag'ts,
307 Walnut Street, Philadelphia.

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AMERICAN LINE.

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Weekly Mail Steamship service between

PHILADELPHIA AND LIVERPOOL,

CALLING AT QUEENSTOWN,

Sailing every Thursday from Philadelphia and
Sailing every Wednesday from Liverpool.

The following Steamers are appointed to sail from Philadelphia.

PENNSYLVANIA, July 2.	*KENTWORTH, July 23.
ILLINOIS, July 9.	INDIANA, July 30.
OHIO, July 16.	*ABBOTSFORD, Aug 6.

PRICES OF PASSAGE IN CURRENCY.
Cabin \$75 to \$100 according to accommodations.
Steage and Intermediate tickets to and from all points at the lowest rates.

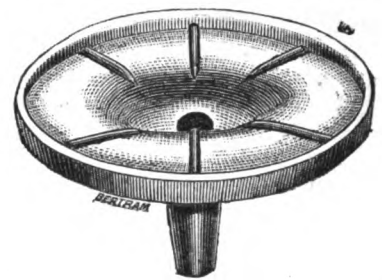
Steamers marked with a STAR do not carry intermediate. Passenger accommodations for all classes unsurpassed. Ample attendance is provided. Every Steamer carries a surgeon and stewardess.

These Steamers are supplied with Life-Rafts in addition to the usual Life-Boats and Life-Preservers.
Through tickets and through Bills of Lading issued between all prominent points.

For passage, rates of freight and other information apply to
GEO. W. COLTON, Agent, 42 Broad Street, N. Y.
PETER WRIGHT & SONS, General Agents,
307 Walnut Street, Philadelphia.

Richardson, Spence & Co., N. & J. Cummins & Bros.,
Liverpool. Queenstown.

PATENT BATTERY INSULATOR.



"As near perfect as we can reasonably expect in a contrivance for this purpose."

THE BEST BATTERY INSULATOR IN USE.

OVER 4,000 FURNISHED THE WESTERN UNION TELEGRAPH COMPANY UP TO THIS TIME.

The Montreal Telegraph Company have adopted them, and have 2,500 now in use in their principal offices.

THEY THOROUGHLY INSULATE THE BATTERY, and save more than their cost.

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Liberal reduction for large quantities.

A VERY SUPERIOR SCREW GLASS INSULATOR CHEAP.

All kinds of Telegraph and Electrical Supplies on hand.

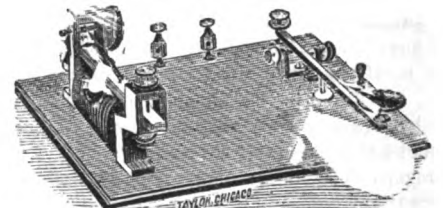
WATTS & CO.,

BALTIMORE, MD.

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THE AMATEUR'S Telegraph Apparatus.

(PATENTED APRIL 16TH, 1872.)



With this Instrument is furnished

A Complete Outfit for the Student,

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CHEMICALS, and

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There are several thousand in use.

PRICES:

Complete Outfit	\$7 00
Sounder and Key	6 00
" " with Out-Out and Lightning Arrester	7 00
Sounder No. 3	4 00
" No. 4	3 00
Key No. 4	4 00

GEO. H. BLISS & CO.,

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JOURNAL OF THE TELEGRAPH.

VOL. VII. NO. 14.

NEW YORK, JULY 15, 1874.

WHOLE NO. 161.

UNDERGROUND TELEGRAPHS.

A recent number of the *Journal of the Society of Telegraph Engineers* contains a paper on Underground Telegraphs, by Mr. G. E. Preece, from which we extract the following description of the electrical arrangements employed in a traveling testing van. The subterranean line of which the tests were made extended under the country road between Liverpool and Manchester, and consisted of fourteen wires. The van was designed specially to meet all the various requirements of a lengthened land cruise, and it was found admirably adapted for every purpose:

"The electrical apparatus consisted of one hundred No. 3 Leclanché batteries, especially mounted on well insulated troughs. As the tests of the cable were to be almost identical with the ordinary tests of a submarine core, the insulation of batteries and instruments was carefully looked to. The instruments consisted of resistance coils, various keys, and very sensitive galvanometers, the principal of which was a small Thomson galvanometer, specially constructed for the work, fitted with several improvements to meet the difficulties of great vibration and liability to damage on the road, as well as to be quick and easy of adjustment. This galvanometer answered so perfectly that under all circumstances its use was much preferred to that of the delicate horizontal astatic galvanometer carried in the van, its adjustment being quicker.

It being necessary to test the various joints throughout the work, a special joint trough was made for the purpose. For placing inside boxes it was provided with ebonite feet to insure good insulation, and, in cases where it might be necessary to suspend it, eyes at each corner were made, ebonite shackles accompanying it to improve the insulation. Two hooks were attached to the bottom of the trough to keep the joints in their place.

For carrying out the tests it was necessary to make "earth" wherever the van stopped; for this purpose a copper plate was carried for such places where water might be convenient, and also a long iron tube (a hollow crowbar), pointed at the bottom end, and with a screw connection for the earth wire at the top. This rod was driven into the ground in the dampest places, and answered admirably. The end was subsequently perforated, and a cup inserted near the head, so as to allow of water being poured in to increase the dampness of the earth. For testing in

the streets an iron clamp was made with a terminal on to it. This clamp was screwed on to one of the lugs of the iron box after it had been well filed, but it was generally found that the best earth was obtained with the "earth rod."

The testing the several cables for insulation and for copper resistance was a comparatively easy matter, but the proper method of testing the joints was a question of some difficulty. This had to be done soon after the joints were made, and to be done without stoppage or hindrance to the work, at the same time that the testing should be kept well up to the

wire, therefore, in a joint-box will at once present the two ends of this continuous circuit, and render any tests of whatever kind perfectly easy."

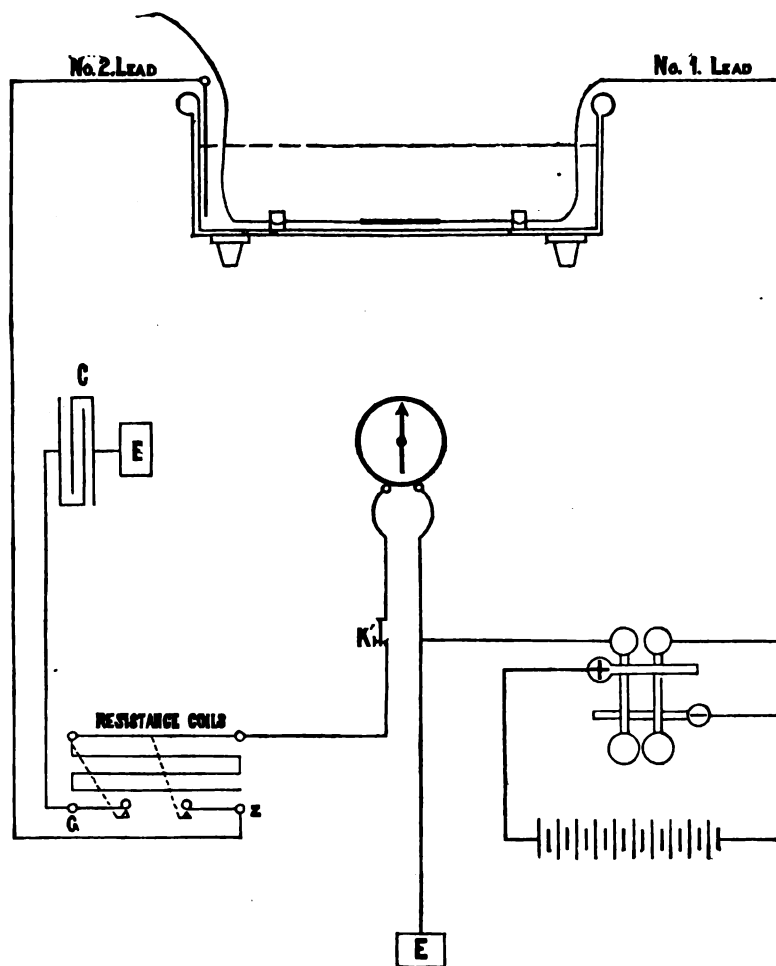
Mr. Preece shows in a diagram, how, by looping the ends of the wires, a continuous circuit is formed, and goes on to say, that a current being passed in at No. 1, would traverse backwards and forwards along the route, going through each wire, and finally returning through the last wire to No. 1 again.

"The difficulty in joint testing with a wire extended, is, that you cannot get at the end for 'charging' the wire and at the joint for 'observing' the leakage. In a cable factory you have the cable convenient, and can get either end. Joints might be tested along a route by permanently charging from one end, but then you are helpless as to changes; it might also be done with two vans and apparatus, with one wire used for signaling, but that again would be expensive. In the plan adopted, instead of attempting to get to the distant end, I brought it to me, and therefore had both ends of the cable, and all the joints under my command as convenient as at a factory.

It will be seen that if it were necessary to test any set of joints in any one box, all that would be required would be to bring the van and apparatus to the box, then cut the temporary joint in No. 1, and you would have the two ends of a long wire; charge this to whatever potential required, each portion (the extreme end being free) would rise to the same potential, and to test any joint it would be only necessary to take it up and place it in the insulated trough, (see illustration) when the accumulation might be observed, and its quality decided. By means of an arrangement similar to this, every joint save the last, in the final splice of a multiple submarine cable, might be tested.

The various jointers had instructions to make all the joints in the several boxes, with the exception of that in No. 1 wire, the two ends of which were left sealed or temporarily jointed. At stated intervals a box was left unjointed, thus forming a section; at this box the wires were looped in a certain order, 1 to 2, 3 to 4, &c. At the opposite end the wires were also looped, but in the opposite order, 2 to 3, 4 to 5, &c., so that the section represented a continuous length of the fourteen wires broken, however, at each box by the No. 1 wire not being jointed.

When the various joints of a section had been finished, one jointer looped the last box in the manner



work. After a great deal of consideration, and the abandonment of several plans, a system was devised which it is believed will be found the best for adoption in all future underground work.

It was found to be utterly impossible to keep testing the cables singly, and also manage to test the joints. The cables were tested in sections, and immediately afterwards all the joints of that section. The peculiarity of this plan is in so dividing the cables into sections, (varying the length according to circumstances), and in so looping the wires at the two ends, that a continuous circuit is formed. Any

shown, according to instructions. The van then proceeded to No. 1 box, and careful tests of the copper resistance and insulation of each loop were taken; previously, however, currents were sent through to see that the wires were both correctly numbered and correctly looped. After finding that all was correct, the wires were looped at No. 1 box in the order shown, which gave a continuous circuit through all the wires with the exception of No. 1. At the commencement of the tests for a few boxes only, the joints were tried by seeing what insulation they gave. First, the joints being placed in water, not connected to earth but perfectly insulated, the deflection due to the leakage of the cable itself was taken, then the water was put to earth, the deflection was again noticed to see if there was any increase, such increase being evidently due to the joints only.

The instrument used was the Thomson Reflecting Galvanometer, fixed on a tripod; holes were cut in the bottom of the van, and the tripod rested on the ground without touching the van. Under these circumstances the Thomson acted very well, the only movements of the magnet being caused by the vibration of the ground, or the strength of the wind on the legs of the stand. With regard to the vibration of the ground, it was remarked that those portions of the road bordering on the Old Mosses near Manchester, and at one time forming, no doubt, a portion of the moss itself, the vibration was peculiarly distinct, the presence of carts some hundreds of yards off being easily recognized, the vibration increasing with their nearer approach, until it became so great as to be no longer observable, being too much for the instrument.

Finding that observations could be taken with so much care and so much correctness, the "differential" method of testing joints was abandoned for that of "accumulation," the only correct and reliable method. By this plan any bad joints were at once detected. The delicacy of the instruments employed was very much lower than those in use for testing submarine cables, the ratio being as 1 to 10.

The *modus operandi* of joint testing was as follows: When the van was brought up to the box, it was placed as nearly as possible E. and W. (on account of the galvanometer not being astatic) and the horse was taken out. Whilst the instruments were being adjusted, connections made &c., the assistant and the jointer were engaged in opening the box and preparing the joints, whilst the driver was fixing the earth-rod and getting the different leads ready. The joints were prepared by opening out and unlaying the tape back as far as necessary; the wires were then carefully and thoroughly cleaned with naphtha on each side of the joint; the joint-trough was then cleaned and its insulation made good; it was partly filled with water and then placed in or over the underground box, according as the length of the wire would permit; the joints were then put in the water and secured under the hooks, the cables being kept back from touching the trough by fastening back their tapes. One lead was then connected on to No. 1 wire, previously carefully trimmed, the second lead being joined on to the condenser, whose other end was attached to the accumulating plate in the trough. The third lead was joined on to the earth-rod.

The accompanying diagram will explain the material connections of the van.

No. 1 lead was connected on the battery key, to which the two poles of the battery and earth were connected, the depression of the right hand part sending a zinc current (—), the left hand sending a copper current (+).

No. 2 lead was connected on to the battery key of the resistance coils, which acted as a switch, the left hand or galvanometer key being connected on to the condenser (the opposite plates of which were to earth), the bridge portion of the coils, being in connection with the two keys (when depressed), was joined to the galvanometer, whose other pole was to earth.

A depression of the key *z*, in resistance coils, would at once place the trough in connection with galvanometer to earth, any deflection (+) would at once show that there was leakage in the trough or over the cable. This had to be remedied before the tests could be taken. If no deflection was observed, the tests were proceeded with. The whole cable then is raised to the potential of the testing battery, and the joints as well. If the joints be faulty they must leak, and some of the current must be continually passing into the water.

In testing, the key 2 is depressed so as to put the trough to earth through the galvanometer; the battery key is then depressed and the cable charged; the inductive effect on the trough is at once seen on the galvanometer by its sudden deflection. The cable is still kept charged, and after the induction effect is over, the "scale" is watched to see if the spot remains at zero, or is deflected in the same direction as the inductive charge. If there should be a deflection, then there is what is termed direct leakage through the joint; if not, then the amount of accumulation is tried. The galvanometer circuit is then broken at *K'*, and both *G* and *z* keys of resistance coils depressed for a definite period—60 seconds; the leakage from the joints, however small, passes then into the condenser, where it is accumulated; at the end of the 60 seconds, the key *z* is lifted, and the condenser charge is passed through the galvanometer to earth. According to the amount of the discharge, so is the quality of the joints.

If the discharge was too great, or there was a direct loss through the joints, the joints were taken out of the trough, and placed in one at a time in regular order; the discharges from each were observed and noted, the bad joints being marked for removal.

It is a peculiarity in testing a number of joints so placed that the accumulation obtained from the whole of the joints is always less than the sum of the accumulation of the individual joints.

The van containing all the batteries became, with one pole of the battery to earth, to a certain extent electrified. This was particularly noticed with regard to the condenser, which almost always had some residual charges in it, evidently due to being so close to the batteries. The effect of this was to introduce errors into the joint testing. This was noticed about the first few days of testing, and, after some experiments, the use of the condenser had to be abandoned altogether. Instead of it a long india rubber lead was substituted, which, for facility of work, was wound on a temporary wooden drum. This lead was found to act quite sufficiently, and was used to the last.

On the completion of the tests the joints were replaced in the box and the hole filled up, instruments and everything repacked, and the van moved on to the next box for further joint testing.

The second box was tested in a similar manner, and so on, until the last of the section was completed, No. 1 wire being jointed in every case, generally permanently; but, where there were a number of bad joints, this wire was only jointed temporarily, so as to keep up the connection.

As soon as the jointer had replaced the condemned joints, his joints were tested (in the majority of

cases), and the van proceeded to the loop box of the section for the final test of that section. When the results obtained were satisfactory, the next section was taken, proceeding in a similar manner, and so on, section after section.

As a proof of the value and of the improved insulation obtained by cutting out the bad joints, two statements are given of the insulation resistance of the loops of the sections before and after the joints were cut out. In these sections every joint was condemned and cut out.

In the two cases the means of the 14 wires were:

	Before joints were cut out.	After joints cut out.
No. 1.....	111 megohms.	481 megohms.
No. 2.....	110 "	480 "

After the sections had been passed, one section was permanently joined on to the next and so on; but no section was joined on until the previous lengths had been found to be still in good condition. It will be seen, therefore, that, as a frequent test of the passed work was going on, the appearance of any fault would be at once noticed.

I have been informed that the old Electric Company's "Express" wires had been struck through the ground by lightning. During the work the actual effect of lightning was not seen, beyond one man being incapacitated for a few days by being struck, but the *inductive* effects of lightning were brought to my knowledge by the van jointer, who, jointing one day at a certain box, was alarmed by seeing sparks passing between the jointed wires (not covered with percha) and his joint box, against which they were resting.

With the present wires the boxes are all underground, except the street boxes. In the express wires the tops of the boxes were above ground.

On the completion of the work some final electrical tests were taken.

The insulation tests were taken in the ordinary manner, the deflection being noted at the end of the first minute. From the deflection the calculations were made. The deflection due to the leakage was carefully watched from the commencement, and in every case of the gutta percha tests, except No. 3 Liverpool, the "electrification" was evident and satisfactory; the insulation and percentage of loss being taken as in a cable factory.

The copper resistance was taken by carefully looping the wires together at the opposite end, using a metallic circuit only, doing away entirely with all earth connections and such sources of errors.

First, No. 1 was joined to No. 2,
No. 1 then joined to No. 3,
No. 2 then joined to No. 3.

From these figures the resistance of No. 1 wire was calculated by formula. No. 1 was then used in connection with all the other wires.

The formula is thus expressed. (W. H. Preece.)—

Call No. 1 wire = *x*
No. 2 " = *y*
No. 3 " = *z*

Then—

$$\left. \begin{array}{l} x+y=a \\ x+z=b \\ y+z=c \end{array} \right\} \text{These are known by direct measurement.}$$

Subtract 1 from 2,

Then $y-z = a-b$

But $y+z = c$

$2y = a - b + c$

$a - b + c$

$y = \frac{a - b + c}{2}$

$a + b - c$

$x = \frac{a + b - c}{2}$

$$z = \frac{b+c-a}{2}$$

The resistance of No. 1 wire will be, in other words—

$$\text{No. 1} = (1+2) + (1-3) - (2+3) + 2.$$

The R. of 1 and 2 + the R. of 1 and 3 — the R. of 2 and 3 divided by 2, gives the required R.

This method, wherever practicable, is far superior to the use of an earth, which necessitates duplicate tests.

THE DECAY AND PRESERVATION OF TIMBER FOR TELEGRAPHIC PURPOSES.

BY W. LANGDON.

THERE are two kinds of decay, viz., *dry* and *wet rot*. The former is a slow mouldering action due to the presence of a species of fungus, by which all the tensile strength and cohesion of the wood is destroyed and reduced to a fine snuffy dust. To this we are fortunately so seldom subjected that it may be fairly disregarded. It is in *wet rot* that we find our great enemy. *Wet rot* is of two kinds,—*oxidation* and *disintegration*. The first is a species of slow combustion or “*eremacausis*.” The albuminous and nitrogenous materials of the sap ferment under the influence of heat and moisture, and react on the cellulose and lignin which they decompose. Worms, insects, fungi, animalculæ, &c., enter the fibres of the wood and disintegrate its structure by their growth and multiplication. The oxygen of the air unites with the remains and slowly but surely rots it away.

The point at which telegraph poles decay is that at which the greatest strength is required, viz., the ground line, known as the *wind and water line*. The explanation of this is that the condition of a telegraph pole once planted speedily becomes analogous to that of its surrounding medium. Whilst that portion above ground, if unprotected by paint or some other oily preservative, acquires a degree of moisture almost equal to that held in the atmosphere surrounding it, the lowest portion—the butt end—will be found saturated with wet, the density of which becomes less and less as the ground line is reached. This moisture is due to absorption from the contiguous ground and percolation from the atmosphere. Besides “slow combustion,” there is another process of disintegration of a mechanical nature, to which the destruction of our poles is mainly due. The tiny particles of moisture held in the outer pores of the wood first become heated by contact with the warmer atmosphere, then volatilise, and, finally bursting as under the delicate fibres by which they are bound, escape into the surrounding air. This action is again and again repeated until the structure is utterly destroyed.

The methods adopted for the preservation of timber are of two kinds,—the one applied *externally*, the other *internally*. The external applications are:—

1. *Seasoning*, which consists of stacking the poles in such a way that the air can freely circulate around them and favor the escape of the sap.

2. *Charring and Tarring*.

Charring consists in slightly roasting the surface of the pole, when it is dry, to a distance of 6 feet or more from the base. It expels the sap; destroys the external ligneous pores of the wood, coating it with a hard shell; checks absorption; and kills the germs of animal and vegetable life. It is done over a moderate fire. The portion charred and some 3 feet above is usually coated with tar while hot. The internal application of the best known preservative processes is—

1st. The introduction into the pores of the wood of some *salt*, which, uniting chemically with the albumen of the sap, is stated to convert it into an insoluble compound.

2nd. The introduction of some *oil*, which not only acts as an antiseptic, but renders the woody tissue waterproof.

Under the first head several processes have been tried, but the best known are Burnetising, Kyanising, and Boucherising.

Burnetising consists in impregnating the timber with a solution of sulphate of zinc. The process does not appear to have been much employed of late years. *Kyanising* consists in impregnating the timber with a solution of corrosive sublimate (mercuric chloride). *Boucherising* consists in impregnating the timber with sulphate of copper, and is effected by applying a solution of this description to the butt-end of the pole under a gentle pressure. The lasting properties of this process appear to vary considerably.

We now come to the preservation of timber by oil, and under this head we have simply to deal with that system known as *creosoting*. Creosote is not only an antiseptic, but it destroys any vegetable germ which may exist in the timber. Its usual mode of application is by placing the poles within an airtight cylinder, and exhausting the air from it. The creosote is then turned into the cylinder, and injected into the wood, under a pressure varying according to the contents of the cylinder. In creosote we no longer deal with an *absorbent of moisture*, but with something *directly opposed to it*. Let the timber be dry when the creosote is applied, and that under proper pressure; the result need not be questioned. But let the timber be wet, and it is probable that at no distant date the core will become rotten, for to this point will have been driven the moisture. It should not be forgotten that timber treated with creosote is not impervious to the sun's rays, which brings the oil to the surface. Some of it evaporates, whilst the rest trickles down the pole, forming a little mass around its base at the ground-line. It is desirable for this reason that such poles should occasionally be served with a coat of tar.

The merits of the processes are gathered from the following:—

1. The life of an unprepared pole is seven years.
2. That specially-selected foreign timber, Burnetised, has lasted with repairs from eighteen to twenty-four years.
3. The Boucherised timber may be said to last ten to fourteen years.
4. That creosoted poles planted twenty-five or twenty-six years since are still apparently in a state of perfect preservation.

It would thus appear that with those systems classed under the head of preservation by a salt by which *moisture is contracted*, we have a varying and uncertain extension of the life of timber; but in no case is the extension such as to compete with that secured by creosote, by which *moisture is rejected*. All preserved timber becomes what is technically termed “*short*,” that is, it easily breaks in two. When the whole of the wood is thoroughly impregnated with the process, its tensile strength becomes impaired.

EVERY condition in life has its advantages and its peculiar sources of happiness. It is not the houses and the streets which make the city, but those who frequent them; it is not the fields which make the country, but those who cultivate them. He is wisest who best utilizes his circumstances, or, to translate it, his surroundings; and happiness, if we deserve it, will find us, wherever our lot may be cast.

DEPTH OF THE MAGNETIZED LAYER IN A BAR OF STEEL.—*M. Jamin*.—The author conceives the bar as made up of threads, or elementary chains, formed of small magnets joined by their contrary poles. The contrary poles facing each other are concealed, so that the threads are inactive except at their extremities where there are free poles. The threads lie parallel to the axis in prismatic bars, but, as the free poles repel each other, they expand by diverging and terminate at different points of the free surface where they develop reactions. In each element of surface the intensity is proportional to the number of poles and the square of the detaching force. The total number of threads on the total quantity of magnetism is equal to the sum of the intensities for each element, that is, to the sum of the square roots of the detaching forces. There are four points to be examined:—(1) The sum total of the threads which traverse the middle zone. (2) The law of their distribution in this zone. (3) The sum total of the intensities distributed in the free surface. (4) The distribution of these intensities. The author experimented with four series of steel plates, having thicknesses of 1, 2, 3, 4, m.m. and 1 metre long, by 50 m.m. broad. He traced, parallel to the length, four equidistant lines, dividing them into 5 bands of 50 m.m. breadth, then at distances 0, 50, 100 m.m. from the extremity he measured the detaching forces of a small proof contact suspended from a balance. He concludes (in general) from his experiments that in a thick bar of steel there is no magnetization at the centre; that the elementary threads only begin to appear at a distance of 3 or 4 m.m. from its surface, but that they are multiplied and contracted more and more in the free surface. The law of decrease of magnetic quantity agrees with the formula $F - F$ being the intensity at the superficial point ay

$\frac{F}{a}$ (it is— at distance 1, $\frac{F}{a^2}$ at distance 2, &c.) The totality of magnetism condensed in a plate of thickness y is—

$$m = 25 \left(1 - \frac{1}{(1.6)y} \right).$$

This quantity is $n\lambda$ for $y = 0$, increases very rapidly up to 1 and 2 m.m., very slowly thereafter. For an infinite thickness $m = 25$, hardly more than for 3 or 4 m.m.

INFLUENCE OF ALBUMENOID SUBSTANCES IN ELECTRICAL PHENOMENA.—*M. Onimus*.—*M. Becquerel* has shown that when two heterogeneous liquids are separated by an organic membrane or by a capillary space, they give an electric current capable of producing chemical and mechanical effects, reduction of metals, and double decompositions, &c. The author finds that the interposition of a layer of albumenoid matter (white of egg, albumen of blood) has the same electro-chemical results. Thus, with solutions of sulphate of copper and of oxalate of potash separated in a tube by albumenoid substance, beautiful blue crystals of oxalate of copper and potash are obtained. The phenomena, he points out, may throw light on the formation of phosphate of lime in animals. This is obtained in the U tube when the two liquids used are phosphate of soda and nitrate of lime, or chloride of calcium. Again, *M. Cl. Bernard* has shown that all salts of iron passing through the system are transformed by way of deoxidation or passage to the state of proto-salt. Now, the same transformation occurs when perchloride of iron and red prussiate of potash are in contact with albumen in the tube. The perchloride is changed into the protochloride.

CORRESPONDENCE.

To the Editor of the Journal of the Telegraph:

Why is it so many apparent defects exist in telegraphic apparatus and material, particularly when such defects can be readily discovered by examination and experiment?

I will mention a few instances. Electro-magnets that are intended for delicate work, are furnished with massive and badly shaped armatures, when it can be positively demonstrated that an armature properly made and suited in weight to the magnetic force required, will make a telegraph instrument many times superior.

The form of Callaud battery which is extensively used in this country, and which is undoubtedly a constant and economical battery when properly constructed and cared for, is rendered very troublesome by faults in the manufacture of its parts, which also destroys the economical properties of the battery.

Twelve condensers made in New York and sent here to be used with duplex, have their capacity represented by the letters "M. F."; for example No. 14 is marked "4 M. F." Now if this mark stands for mega-farads, then the capacity of the condenser is represented as being 4,000,000 farads, or capacity sufficient for all the cables in the country and some over. If it is intended for micro-farads, then this condenser would be represented as having a capacity of 0.000004 of a farad, and the whole twelve would not have near the capacity of one knot of cable.

Below is a test of the twelve condensers, showing some serious defects in their construction.

Original Marks.	Immediate discharge.	Percentage of charge remain'g after 15 seconds free.	Percentage of charge remain'g after 5 seconds free.	REMARKS.
20 3 M.F.	210 Div.	90.4		Fifteen seconds allowed in all tests for electrification, with about one Volt tension.
14 4. "	320 "	45.3		
15 4.5 "	300 "	41.6		
21 3.6 "	215 "	9.3		
16 4.4 "	210 "	0	3.8	
18 3.4 "	5 "	0	0	
17 5.6 "	8 "	0	0	
6 5. "	195 "	0	3.5	
8 4.3 "	180 "	2.7		
22 5.7 "	400 "	16.9		
13 4. "	240 "	87.5		
7 5.2 "	340 "	26.4		

From the above table it will be seen that Condenser No. 20 is much the best one of the lot, and that Nos. 16, 18, 17 and 6 are worthless.

The No. 2 Havana cable retains 97.5 per cent. of its charge after fifteen seconds free, and has a capacity per knot of 0.3521 farads.

DE BREE.

KEY WEST, Fla., June 30, 1874.

JACKSON, MICH., July 6th, 1874.

To the Editor of the Journal of the Telegraph:

I don't think there has been quite enough said in regard to the delivery business, and if not too late, allow me to suggest that the Company issue books of receipts, (in duplicate,) with sufficient space for number, time and signature, and have one receipt attached to its corresponding message and filed with it. If no receipt could be obtained, the blank would be just as suitable for filing the why and wherefore. Or the company might do away with the duplicate, and issue single receipts, either of which, I think, would be an improvement upon the present means of preserving receipts for reference, more especially small offices, where messengers destroy a book before it is filled up.

JAY G. HALL.

PRESENTATION.

SAN FRANCISCO, June 30, 1874.

To the Editor of the Journal of the Telegraph:

Good deeds are worthy of record, and a good record should not be ignored. Miss Susie King has been the operator at the Front street office of the Western Union Telegraph Company, in this city, for about three years, and during that time her record has been excellent, the proof of which is a very complimentary letter from the General Superintendent, upon accepting her resignation, which takes effect to-day. And as a further testimonial of her attention to business, the merchants of that locality—wholesale dealers—to-day presented Miss King with a purse of gold, and the following letter:

SAN FRANCISCO, June 30, 1874.

To Miss SUSIE W. KING:

As an acknowledgment of our appreciation of the uniform courtesy and attention you have always extended to us, while you have been in the employ of the Western Union Telegraph Company, at the office on the corner of Front and Sacramento streets, in this city, the merchants who have been favored by your services beg your acceptance of the accompanying purse, with their best wishes for your future happiness and prosperity. While we omit our names, you may feel assured that this is from

YOUR MANY FRIENDS.

As a further appreciation of her worth, the head salesman of one of the Front street houses presents himself and his estate, which Miss K. accepts, and the two are shortly to be made one. Truly virtue hath its reward.

SOUNDER.

LUDLOWVILLE, July 6, 1874.

To the Editor of the Journal of the Telegraph:

I want to endorse what Dunkirk says in JOURNAL for July 1st, about a rule regulating use of circuit. When struggling has occurred on this wire, it is invariably the case that the terminal and larger offices have broken a way station before giving them a reasonable chance to call, and a way station of spirit will not "tamely submit." A large office, simply because it is a large office, should not be allowed to ride over the smaller ones.

I wish also to endorse New Orleans' remarks about preserving inviolable the privacy of all messages. Small offices labor under disadvantages that large ones do not in this respect. Nearly all customers and callers at small offices are personal friends of the operator, and some thoughtlessly, others with design, ask the most impertinent questions concerning messages for other persons, and are too dull to understand why they should not be answered. No message can leave the office for delivery but some one must determine to know all about its purport. Occasionally a too prying party has to be told that the subject is "none of his business" but a flat refusal is sometimes very hard to give, as the operator doesn't want to give offence. I would suggest that a card be placed conspicuously in every office—

All messages and business strictly private. It is unlawful to divulge the contents of any message. DON'T ASK.

J. J. MITCHELL, Manager.

RIVERSIDE, TEX., June 20th, 1874.

To the Editor of the Journal of the Telegraph:

How is an indicator made? Please give some information, which will be gratefully received.

T. C. COOPER.

What kind of an indicator?

JULY 2, 1874.

To the Editor of the Journal of the Telegraph:

I do not think that our Company has the right idea for a tariff yet. A "Tariff Bureau" should perform the labor of preparing all tariffs. How is it now? I open a new office, and ask for tariff. What do I receive? A book that will be a guide to an operator? By no means. I receive the original book, which is about half wrong, and must be corrected by the March Supplement (which is kindly sent), and all the JOURNALS which have been issued since that supplement; and in addition to this operators are expected to write in under proper headings more new offices than the book will hold. How long do they (the managers of the tariff department) think it would take a railroad superintendent to prepare a new book from the materials furnished? Have they thought anything about it? I fear not.

The fact of the matter is, there is a good week's work for a clerk having nothing else to do, and we railroaders do not have any clerks, and our operators are, nearly all of them, station agents also, and rushed from 6 A. M. until midnight. Do you wonder at the fact that tariffs get mixed and check errors ensue.

Now, then, let us have a State tariff, a certain sum to all places within the State, and then graduate the tariff by States, according to distance. Then give us a monthly pamphlet containing the names of all offices, by States, up to date of issue (I mean a list revised by the Tariff Bureau monthly, and issued as cheaply as possible). Perhaps it would be a good idea to combine the JOURNAL and Tariff Book, and issue monthly.

Another good arrangement (and the best, if not too expensive,) would be to compile a perfect railroad map of the United States (covering the whole Western Union system), showing all stations and switches, and then make tariff by actual measurement from each office, by riveting a measuring tape to map at office using it.

If there is anything worth using herein you will use it without knowing who says it, so I will only sign

S. C.

NOVEL APPLICATION OF TELEGRAPH WIRE.

Mr. L. Schwendler showed, at the meeting of the Asiatic Society, a crow's nest made of pieces of telegraph wire, twisted together in a most ingenious and knowing manner. He said that lately such nests had been found frequently, and that it seemed as if the crows of India benefitted by the introduction of Western civilization, and were by no means behind the age. As long as the crows built their wire nests on trees and buildings only, he as a telegraphic engineer would not object, but often they selected telegraph posts, between which and the telegraph wires they built those wire nests, causing what are known as "earth" and "contact," and interfering with communication. Crows, however, were by no means the only animals interfering by their domestic arrangements with overland telegraphy. Wasps build their mud nests in the porcelain insulators, causing, in rain and dew, leakage from the wire to the ground. Birds of prey frequently dropped dead fish and other offal upon the wires, causing contact. These were all frequent sources of temporary interference with telegraphic communication upon overland lines, and they, combined with many other facts not necessary to mention, seemed to show that it would be to a very great advantage to use subterranean telegraphs instead of overland lines.—*Calcutta Englishman*.

THE TELEGRAPH IN MEXICO.

The following extract in relation to the telegraph interests of Mexico, is taken from the report of the Department of Public Works of the Republic to the Mexican Congress: "Of the lines now in operation, some belong to the Federation, some to the States, and others to private companies. The following telegraphic lines belong to the Federation: The one which starts from the City of Mexico passes through Cuautitlan, Tepejé del Rio, Arroyozarco, San Juan del Rio, Querétaro, Allende, Dolores Hidalgo, San Felipe, San Luis Potosí, Moctezuma, Charcas, Matehuala, Salado, Gomez, Farias, Saltillo, Monterey, Cadereita Jimenez, Cerralvo Mier, Camargo, Reinos, and the port of Matamoros; there being a telegraph office at each one of the twenty-three places above mentioned, and comprising a distance of 1,400 kilometers in length. At Matamoros this line connects with those of the United States, and consequently with Europe. The line which leaves Querétaro and passes through Celaya, Salamanca, Irapuato, Guanajuato, and Leon, with branches to Salvatierra, Valle De Santiago, Penjamo, Cuitzeo, and Dolores Hidalgo, telegraph offices being established in each one of the places mentioned. The length of this line, with its branches, is 398 kilometers. That which starts from the City of Mexico, 223 kilometers in length, and which passes through Toluca, Ixtlahuaca, Tlapachua, and Maravatio, from which latter point it communicates with Salvatierra, closing the circuit at Celaya, which facilitates communication between the capital of the republic and the interior lines, independently of that which is established via Querétaro. The telegraph line which passes through Tacabaya, San Angel, Tlalpam, Cuernavaca, Puente de Ixtla, Iguala, Chilpancingo, and Tixtla Guerrero, comprises a distance of 376 kilometers, and will be continued as far as the port of Acapulco. [The line has been finished to the said port since the publication of the report from which these data are taken.] The line which starts from the port of Mazatlan, and passes through Concordia, Pánuco, Copala, Ceyotes, Durango, Nombre de Dios, and ends in Chalchihuites, is 498 kilometers in length. The line from Tehuacan to Oaxaca, which is 251 kilometers in length, and passes through Teotitlan and Cuicatlan. The line which starts from Minatitlan, is to place in communication the States of Vera Cruz, Tabasco, Campeche, and Yucatan with the capital of the republic; two sections of the said line are already in operation; one from Minatitlan to San Juan Bautista, and the other from Campeche to Champoton. The whole line, when finished, will be 689 kilometers long.

The following telegraph lines also belong to the Government. Those established in the States of Yucatan and Campeche, with offices at Mérida, the Port of Progreso, Sisal, Huemanac, Tixkokob, Izamal, Acancek, Mama, Tuul, Tekax, and Maxcanú, in Yucatan, and in Kalkini, Tleselcahan, Iturbide, Champoton, and Campeche, in the State of the same name. These lines are 520 kilometers in length.

The State of Zacatecas owns the line which begins at San Luis Potosí, and runs through Ojo Caliente, Zacatecas, Fresnillo, Sombrete, Chalchihuites, Aguascalientes, Jerez, and Villanueva; this line is 660 kilometers long. The State of Michoacan owns the line which starts from Salvatierra and pass through Acámbaro Maravatio, Morelia, Pátzcuaro, and Arrio. This line is 190 kilometers in length. The line of the Jalisco Company starts from Leon, passing through Lagos, San Juan de los Lagos, Aguascalientes, Pegueros, Tepetitlan, Zapotlanejo, Guadala-

jara, Tepic, and San Blas, Guadalajara, Zayula, Zapotlan, Colima, and the Port of Manzanillo, 930 kilometers long. The Vera Cruz Telegraph Company owns the lines which start from the said port and run, one to Minatitlan, and another to the port of Tampico, the former passing through Alvarado, Tlacotalpam, Tuxtla, and Acayucan, and the latter through Jalacingo, Papantla, and Tuxpan. The line which runs from this city to Vera Cruz, passing through Riofrio, Puebla Acatzingo, la Cañada, Orizaba, Córdoba and Vera Cruz, also belongs to a private company, and the other line, which follows along the Mexican Railroad as far as Nopalucan, and then passes through Tulancingo, Perote, Jalapa, and Vera Cruz. This company likewise owns the lines from Mexico to Pachuca and Tulancingo, from Puebla to Tehuacan, from Puebla to Tlaxcala, and from Mexico to Chalco and Ameca. The telegraph of the Mexican Railway Company goes from this capital to Vera Cruz, following the railroad and the branch to Puebla.

The extent of telegraph lines already in operation and being constructed in the republic is as follows:

	Kilometers.
Owned by the Government.....	3,892
In course of construction.....	1,050
Owned by States.....	970
Owned by private companies.....	2,179
Total number of kilometers.....	8,001
Or about.....	5,000 miles

The total number of telegraph offices owned by the Government is 73.

THE BRAZILIAN TELEGRAPH.

We congratulate the shareholders of the Construction and Maintenance Company upon the success with which the laying of the Brazilian telegraph has been carried out. The work is not only one of great importance as a means of direct communication between Europe and South America, but will, in a financial point of view, be of great service to the Eastern Telegraph Company, in bringing additional traffic to their cable at Lisbon, where they are connected with each other. The contract price was £1,400,000, and a very large portion of that amount is clear profit, and will go to reward the shareholders of the Construction and Maintenance Company for their enterprise. As is usual on such occasions, courtesy takes precedence of commerce, and complimentary messages have been flying through the cable from and to Brazil. The Emperor is so elated that he is profuse in his congratulations. We know not whether he has communicated with any of the private friends he acquired during his recent visit to this country, but, as a member of the Geographical Society, he has requested Sir H. Rawlinson to convey to his *confrères* his acknowledgment of the favorable manner in which they received him. The rates per twenty words from any telegraph station in Great Britain or Ireland are as follows:—To Madeira, £1 1s. 6d.; to St. Vincent, £2 17s. 6d.; to Pernambuco, £6 2s.; to Bahia and Para, £8 6s.; to Rio de Janeiro, £9 6s.; to Monte Video (by post from Rio de Janeiro), £9 7s.; to Santos, Santa Catarina, and Rio Grande do Sul, £10 9s. Half these rates for every additional ten words. Postage to the Gold Coast and Cape of Good Hope from Madeira or St. Vincent, 1s. 6d. Arrangements have been made for homeward messages by which telegrams from all places in postal communication with Madeira and St. Vincent may be forwarded to their destination by telegraph immediately on the arrival of the mail steamers.—*Railway News*.

CENTRAL AMERICAN TELEGRAPH.

A special meeting of this company was lately held at London, Mr. John Heugh in the chair, for the purpose of considering a suggestion for the amalgamation of this company with the West India and Panama Telegraph Company.

Mr. Bompas (the solicitor of the company) having read the proposed agreement,

The chairman said that by the amalgamation of the two companies they would monopolise the traffic and raise the value of the respective shares, for this company had cables, but they were not yet laid, and the other company had got theirs all laid and repaired at considerable expense. By taking this company's cables and concessions they would have a duplicate line along a bed of mud instead of on the hard rock bottom under the West India and Panama Company's concession. The question of price then arose, and had been satisfactorily arranged for both companies, and the agreement had been sanctioned without hesitation and unanimously by the board. He then proposed the sanctioning of the agreement of amalgamation, which having been seconded by Mr. Alfred Seymour, was carried unanimously.

At an extraordinary general meeting of the West India and Panama Telegraph Company, the special resolutions adopted on May 30th, for the increase of the capital to £1,900,000, the purchase of the Central American, and other matters were unanimously confirmed.

The first report and statement of the liquidation of the French Atlantic Telegraph Company will be submitted by the liquidators to a meeting summoned the 26th inst. After making a sufficient reserve to meet further contingencies and expenses, the liquidators propose to distribute 4s. per share.

EASTERN EXTENSION, AUSTRALASIA, AND CHINA TELEGRAPH.—The directors have declared an interim dividend for the quarter ending 31st March, at the rate of 6 per cent. per annum, or 3s. per share, free of income tax, payable on the 15th proximo.

EASTERN TELEGRAPH.—The directors have notified that, subject to the final audit, the accounts show a balance which will enable a dividend to be recommended at the meeting on the 14th of July of 4s. per share, making, with previous payments, 6 per cent. for the year ended the 31st of March, carrying to reserve about £39,000.

THE traffic receipts for the month of May of the Great Northern Telegraph Company were 365,264 francs, against 328,797 francs for the corresponding month of last year. The total traffic receipts from January 1 to May 31 were 1,647,495 francs, against 1,184,486 for the corresponding period last year.

THE number of messages (of twenty words) passing over the Barcelona-Marseilles cable of the India Rubber, Gutta Percha and Telegraph Works Company, for the month ending May 31, was 5,478, against 4,067 for April.

Messrs. C. S. Hambro and Son notify the payment, on the 1st of July, of the interest on the shares of the Great Northern Telegraph Company, at the rate of 5 per cent. per annum.

THE total number of messages forwarded from postal telegraph stations in the United Kingdom during the week ended June 20, 1874, and during the corresponding week of 1873, was: Week ended June 20, 1874, 388,851; week ended June 21, 1873, 341,551—increase in the week of 1874 on that of 1873, 47,100.

TARIFF BUREAU.

SEMI-MONTHLY CIRCULAR.

EXECUTIVE OFFICE,
WESTERN UNION TELEGRAPH COMPANY,
145 BROADWAY, NEW YORK,
July 15, 1874.

To all Offices on W. U. Lines:

The following changes and additions have been made since the date of the last circular:

GENERAL INFORMATION.

The P. O. A. of Hillsboro, Ala., is Dry Creek, Lawrence Co. Beaver Creek, Col., changed to Beaver Brook.
Allen's, Ind., re-opened.
Weaverton, Md., closed.
Deer Park, Md., re-opened, square 122.
Mechanicsburg, Md., should read Mechanicstown.
Blocks, Mo., re-opened, square 456.
Marble Hill, Mo., changed to Lutesville.
Woodbridge, N. J., closed.
East Hampton, L. I., N. Y., re-opened as a summer office, square 33.
Scipio, N. Y., closed.
Baldwin, Pa., square 76, is in Dauphin Co.
Montrose and Montrose Station, Pa., square 53, are both in Susquehanna Co.
Red Bank, Pa., square 140, is in Clarion Co.
Messages taken for the following points should be sent to Plymouth, Pa., from which office they will be delivered. Charges for delivery to Boston Mines and Blinatown, Pa., 50 cents; to Broadway, Jersey Mines and Poke Hollow, Pa., 25 cents.
Acton, S. C., re-opened.
Brazos, Santiago, Texas, closed.
Clarksville, Cameron Co., Texas, closed.
Charlestown, Jefferson Co., W. Va., re-opened.
Burr Oak, Wis., closed.

SUMMER OFFICES RE-OPENED.

29 Pequot House, Conn., check New London.
47 Ashbury Park, N. J.
40 Catskill Mountain House, N. Y.
169 Little Mountain, O.
* Rocky Point, R. I., 30 3 from Providence.
18 Tiverton, R. I., check Fall River, Mass.
Watch Hill, R. I., 15 cents more than Stonington, Conn.
143 Alleghany Springs, Va.
133 Blue Ridge Springs, Va.
133 Healing Springs, Va.
133 Hot Springs, Va.
142 Jordan Alum Springs, Va.
142 Rockbridge Alum Springs, Va.
142 Rockbridge Baths, Va.
143 Sweet Chalybeate Springs, Va.
133 Warm Springs, Va.
143 Yellow Sulphur Springs, Va.
143 Sweet Springs, West Va.

NEW OFFICES.

Paso Robles Springs, Cal.
San Miguel, Cal.
557 Beaver Brook, Col., (formerly Beaver Creek.)
* Cariboo, Col., 40 3 557 Central City.
347 Emden, Ill.
318 Lake City, Ill.
358 Naples, "
299 Rosedale, Ind.
* Blue Hill, Me., 25 2 9 Ellsworth.
* Deer Isle, " 25 2 9 "
* Sedgwick, " 25 2 9 "
18 Silver Lake Grove, Plympton, Mass.
349 Lutesville, Mo., formerly Marble Hill.
360 Williamsville, Mo.
53 State Insane Asylum, N. J., P. O. A. Morristown.
* Hopewell Junc., N. Y., 30 2 46 Fishkill.
* Moore's Mills, " 30 2 46 "
83 Southampton, L. I., N. Y.
* Austinburgh, O., 55 4 159 Youngstown.
* Ashtabula Harbor, O., 40 3 159 "
191 Apple Creek, O.
191 Gann, O.
191 Howard, O.
191 Bennozette, Pa.
93 Lycoming Furnace, Pa., check Ralston.
103 Monterey Springs, Franklin Co., Pa., (summer office).
131 Montrose, Alleghany Co., Pa., P. O. A. Houston.
* Oakland Beach, R. I., 30 3 25 Providence.
165 Altman's, S. C.
175 Ellenton, "
156 Varneville, S. C.

292 Bon Aqua Station, Tenn., (summer office).
* Point Isabel, Texas, 50 5 599 Brownsville.

103 Stephenson's Depot, Va.
Hereafter all messages for the following points on Other Lines must be prepaid:

Furnaceville, N. Y.	Williamson, N. Y.
Hannibal, "	Wolcott, "
Ontario, "	Belle Centre, Ohio.
Red Creek, "	Carey, "
Rose, "	Castalia, Ohio.
Sodus, "	Kenton, Ohio.
Wallington, "	West Liberty, Ohio.

WILLIAM ORTON, President.

TRANSFER SERVICE.

EXECUTIVE OFFICE,
NEW YORK, JULY 11th, 1874.

On July 20th, money order offices will be established at the following named points:

In G. T. Williams' District.

Lebanon, O.
Middletown, O.

GEO. H. MUMFORD,
Vice-President.

THE TELEGRAPHER'S MUTUAL BENEFIT ASSOCIATION.

ACKNOWLEDGMENT OF RECEIPTS FOR ASSESSMENTS
NOS. 63, 64 AND 65, UP TO AND INCLUDING JULY
11TH, 1874.

8, 16, 23, 27, 53, 56, 64, 65, 74, 77, 86, 88, 91, 93, 133, 138, 145, 157, 215, 217, 230, 254, 269, 301, 346, 349, 352, 373, 383, 385, 394, 414, 416, 424, 467, 536, 537, 538, 542, 546, 547, 549, 555, 564, 576, 587, 594, 600, 603, 615, 661, 703, 714, 715, 731, 731, 740, 764, 821, 825, 830, 832, 873, 880, 916, 917, 929, 941, 1001, 1011, 1023, 1024, 1039, 1054, 1061, 1126, 1143, 1147, 1169, 1173, 1175, 1178, 1183, 1195, 1199, 1200, 1210, 1222, 1252, 1259, 1269, 1280, 1306, 1329, 1345, 1364, 1365, 1394, 1402, 1403, 1404, 1409, 1410, 1440, 1444, 1484, 1488, 1511, 1517, 1518, 1527, 1532, 1571, 1590, 1633, 1630, 1632, 1653, 1697, 1698, 1735, 1763, 1811, 1812, 1831, 1894, 1900, 1901, 1906, 1907, 1919, 1926, 1944, 1950, 1965, 1995, 2019, 2020, 2027, 2030, 2036, 2049, 2069, 2083, 2118, 2133, 2135, 2174, 2175, 2190, 2201, 2202, 2203, 2204, 2205, 2206, 2214, 2233, 2239, 2232, 2240, 2241, 2244, 2257, 2259, 2262.

ASSESSMENT NO. 62.

8, 78, 95, 138, 169, 183, 185, 186, 187, 211, 232, 273, 288, 294, 347, 423, 429, 431, 436, 497, 499, 500, 503, 505, 506, 507, 508, 527, 555, 566, 597, 605, 671, 692, 695, 697, 705, 714, 717, 725, 766, 812, 869, 873, 880, 899, 908, 920, 952, 1033, 1069, 1071, 1104, 1134, 1135, 1136, 1138, 1207, 1217, 1235, 1265, 1400, 1421, 1436, 1461, 1463, 1488, 1495, 1496, 1504, 1519, 1553, 1556, 1557, 1559, 1570, 1609, 1610, 1611, 1612, 1613, 1670, 1677, 1697, 1698, 1712, 1723, 1741, 1743, 1777, 1778, 1803, 1843, 1945, 1946, 1947, 1966, 1973, 1995, 2004, 2022, 2023, 2063, 2064, 2066, 2095, 2112, 2128, 2132, 2146, 2150, 2151, 2175, 2176, 2182, 2189.

ASSESSMENT NO. 61.

27, 133, 169, 182, 223, 237, 238, 242, 246, 256, 273, 288, 294, 347, 398, 423, 429, 431, 453, 455, 457, 496, 497, 499, 500, 503, 505, 506, 507, 508, 555, 671, 692, 766, 804, 880, 1033, 1104, 1134, 1135, 1136, 1153, 1182, 1207, 1217, 1235, 1450, 1495, 1496, 1553, 1609, 1677, 1712, 1715, 1716, 1722, 1731, 1743, 1777, 1778, 1786, 1939, 1941, 1974, 1975, 1976, 2037, 2063, 2064, 2066, 2105, 2115, 2132, 2132, 2146, 2150, 2163, 2175, 2177, 2182.

ASSESSMENTS NOS. 58, 59 AND 60.

555, 671, 1033, 1777, 2175.

MISCELLANEOUS.

63.—95, 121, 211, 553, 764, 952, 1995, 2036, 2119, 2163, 2173.
64.—95, 211, 414, 916, 952, 1995, 2173, 2201.

Members of the Association who look to the JOURNAL OF THE TELEGRAPH for receipt of assessments paid, will please take notice, that hereafter an acknowledgment of the receipt of an assessment should be taken as a receipt for all previous assessments.

BORN.

GRAHAM.—At Cornwalls, W. Va., July 7th, 1874, to L. T. Graham, Manager W. U. Tel. Office, a daughter.

DIED.

FURAY.—At Omaha, Neb., June 18th, 1874, Cornelius William, son of C. P. Furay, agent and operator U. P. R. R., Schayler, Neb., aged 10 months.

SAD FATE OF A NEVADA INVENTOR.

A gentleman who has just arrived from the borax fields of the desert regions surrounding the town of Columbus, in the eastern part of this State, gives us the following account of the sad fate of Mr. Jonathan Newhouse, a man of considerable inventive genius. Mr. Newhouse had constructed what he called a "solar armor," an apparatus intended to protect the wearer from the fierce heat of the sun in crossing deserts and burning alkali plains. The armor consisted of a long, close-fitting jacket made of common sponge, and a cap or hood of the same material; both jacket and hood being about an inch in thickness. Before starting across a desert this armor was to be saturated with water. Under the right arm was suspended an India rubber sack filled with water and having a small gutta percha tube leading to the top of the hood. In order to keep the armor moist, all that was necessary to be done by the traveler, as he progressed over the burning sands, was to press the sack occasionally, when a small quantity of water would be forced up and thoroughly saturate the hood and the jacket below it. Thus, by the evaporation of the moisture in the armor, it was calculated might be produced almost any degree of cold. Mr. Newhouse went down to Death Valley, determined to try the experiment of crossing that terrible place in his armor. He started out into the valley one morning from the camp nearest its borders, telling the men at the camp, as they laced his armor on his back, that he would return in two days. The next day an Indian, who could speak but a few words of English, came to the camp in a great state of excitement. He made the men understand that he wanted them to follow him. At the distance of about twenty-five miles out into the desert the Indian pointed to a human figure seated against a rock. Approaching they found it to be Newhouse, still in his armor. He was dead and frozen stiff. His beard was covered with frost, and—though the noonday sun poured down its fiercest rays—an icicle over a foot in length hung from his nose. There he had perished miserably, because his armor had worked but too well, and because it was laced up behind where he could not reach the fastenings.—*Virginia City Enterprise.*

While we are not disposed to be skeptical in regard to the results of any modern invention, however wonderful they may be, and are perfectly willing to believe almost everything which is said to have been done and experienced by the distinguished inventor above mentioned, we are compelled to say that we think the gentleman from the borax fields drew rather a long bow in describing the length of that icicle!—*ED. JOURNAL OF THE TELEGRAPH.*

ADHESION is the force which keeps the particles of unlike bodies in the same relative positions with regard to each other. It is applied to the union of dissimilar bodies only, and is, therefore, opposed to cohesion, which is the force existing between particles of like nature. Thus it is the force of cohesion which keeps together the particles of a piece of lead, but the force of adhesion which causes two plates of lead and tin to remain together after being subjected to pressure. When solids immersed in liquids are wetted by them, it is because the force of adhesion between the solid and liquid is greater than the force of cohesion between the particles of the liquid themselves. Glass plunged into mercury is not wetted, there being no force of adhesion between the two substances.—*Dict. of Science.*

ELECTRIC TELEPHONE.

Mr. Elisha Gray, of Chicago, a gentleman well known as an inventor, and manufacturer of telegraph apparatus, has perfected an instrument by which sounds produced at one end of a wire can be conveyed to the other end by electricity, over circuits of great length. It has already been tested upon the wires of the Western Union Telegraph Company over a circuit of 2,400 miles, with the most satisfactory results. Tunes, played upon the key-board of the transmitting portion of the apparatus, were distinctly audible and unmistakably reproduced, note for note, at the distant end of this long circuit.

The apparatus by means of which this extraordinary feat in telegraphy is accomplished has been named by Mr. Gray the telephone, or, an instrument designed for the purpose of transmitting sound to a distance. It consists of three general parts; first, the transmitting instrument; second, the conducting wire, running to a distant point; and third, the apparatus for receiving the sound at that distant point. The transmitting apparatus consists of a key-board having a number of electro-magnets corresponding with the number of keys on the board, to which are attached vibrating tongues or reeds, turned to a musical scale. Any one of these tongues can be separately set in motion by depressing the key corresponding to it. Thus a tune may be played by manipulating the keys in the same way as those of an ordinary piano or melodeon. The music, produced entirely by electricity, of these notes is so distinctly audible in the next room, that, in spite of much talking, there is no difficulty in determining what tune the manipulator is playing. To this transmitting instrument the conducting wire is attached, the other end being attached to the receiving apparatus, which may be anything that is sonorous so long as it is in some degree a conductor of electricity. A violin with a thin strip of metal stretched between the strings at a point where the bridge of the instrument is ordinarily placed, will, on receiving the sound transmitted through the conducting wire from the piano, give out a tone very similar in quality to that of an ordinary violin. If then the metallic strip is electrically connected with a wire, say, 500 or 1,000 miles long, which has its distant end properly connected with the transmitting instrument, any one at the receiving end can distinctly hear, without the aid of an electro-magnetism, the tune or air which is being played 500 or 1,000 miles away from him, if he properly manipulates the receiving apparatus. The length of the wire connecting the transmitting with the receiving apparatus may be one mile or 10,000 miles, provided that the insulation is sufficiently good to prevent the escape of the electric current before it reaches its destination. In fact, there seems to be no limit to the distance to which sound, of any desired pitch, may be thus conveyed with from two to five cells of battery, all the conditions being proper. The quality of *timbre* of the tones depends upon the character of the receiving apparatus, which may be a violin prepared as described above, a tin hoop, with foil paper heads stretched over it, after the fashion of a baby's rattle, a nickel five cent piece, an old oyster can, and a thousand other things. A sound, sufficiently loud to read Morse telegraphic characters, made by interrupting, with the common telegraphic key, one sustained note has been obtained, under favorable circumstances, at the receiving end of the wire without any more scientific sounding apparatus than that of a piece of common tissue paper.

QUADRUPLE SYSTEM OF TELEGRAPH.

Wednesday afternoon last, at the Broadway office of the Western Union Telegraph Company, a test was made of an invention which promises to be of almost more importance to the present age than were Morse's first achievements to the people of his own time. The test resulted successfully, and it proved that four messages can be simultaneously sent on a single wire, and with no more liability to mistake than as if an equal number of wires were used. To make the matter clear it will be necessary to look a little backward. Morse took the first step in telegraphy—and the first is always the greatest—by the invention of a system by which messages could be sent between any two terminal points, and dropped at any way station on the circuit. The objection to his system was that the transmission of a single message occupied a wire entirely. And though electricians were convinced that a different result could be attained, no one showed how it could be successfully done until three years ago, when Mr. J. B. Stearns invented the duplex apparatus. That was the second great step, and it instantly doubled the capacity of every wire which had been erected. By the Stearns process two messages can be sent simultaneously on a single wire in opposite directions between any two terminal points. Two days ago was taken a third great step, and one not inferior to either of the others. It is a new process of multiple transmission by which two messages can be sent simultaneously in the same direction over the same wire, and either message can be dropped at any way station on the circuit. Nor is this all. The duplex system can be applied to the new invention, and by the combination four messages can be sent simultaneously over the same wire. And not the least recommendation of the discovery is, that it calls for no changes; the old Morse key is used, without the need of any new class of operators (as in the automatic telegraph), and with no duplication except as to parts of machinery. The invention is the result of the joint labors of Messrs. George B. Prescott and Thomas A. Edison. And practically a great deal of credit is also due to the enterprising policy of Mr. William Orton, the President of the Company, through whose encouragement the invention has been perfected. Of course it is needless to add that the new system will be speedily put in practice by the Western Union Company, by whom the patent is controlled. It will make itself felt in more ways than one. For instance, the Western Union Telegraph Company have been forced to erect 60,000 miles of wire during the last three years, and of course at an immense expense. An indefinite future like that could not be very satisfactory to stockholders. But this year scarcely 2,000 miles need be erected, and every wire is practically four. But without further enlargement, and almost in the words of Mr. Orton, the discovery may be called the solution of all difficulties of telegraphic science. —*N. Y. Times*.

THE PROTECTION OF GOVERNMENT TELEGRAPH LINES.

The Secretary of War, in a general order, has published, for the information of the army, the act passed at the last session of Congress to protect lines of telegraph constructed or used by the United States from malicious injury and obstruction, which makes it a misdemeanor to injure or destroy any of the works or property or material of any telegraph line constructed or in process of construction by the United States, to be punished by a fine of not less than \$100 nor more than \$1,000, or with imprisonment not exceeding three years, or both.

CURIOUS ELECTRICAL PHENOMENON.

From the Virginia (Nevada) Enterprise, June 17.

During the past three nights the engineers and machinists at the round house of the Virginia and Truckee Railroad Company, in this city, have been in a state of lively excitement about some strange electrical disturbances which have occurred there regularly every night. For three nights all hands have been engaged in trying to solve the mystery, but have only partially succeeded. The company erected a large smokestack, which rises to a considerable height above the roof of the round house. At the base this smokestack is spread out in the shape of a funnel. It was built in order that the locomotives may stand under it to cool off when they come in off the road, and also while being fired up in the morning. Into the side of this smokestack, three or four days ago, was run a stove-pipe from a stove standing in a room about forty feet distant. It is about this stove that the electrical disturbances take place. The first that was observed of these was about 11 o'clock, four nights since, when P. Pippingham, a well-known machinist, approached the stove for the purpose of putting a stick of wood in it. As the stick neared the stove he received such a shock that it fell from his hand, and his arm was benumbed. He at first thought he had taken a sudden cramp in his arm. In trying again to put the wood into the stove he received a second shock. This time he observed a flash and heard a sharp snap, which he at once recognized as a discharge of electricity. They tried all manner of experiments, and found that the stove was fully and heavily charged with electricity, it giving out sparks and flashes when a piece of iron, steel, wood, or the naked hand approached it. After an hour or two the phenomenon ceased. The next day nothing was seen of it; but the next night, about 11 o'clock, shortly after a locomotive came in and stopped under the funnel of the smokestack, the stove was again charged, and began snapping and cracking, sending out sparks and flashes on all sides. So it has been every night since. They now know that the heated locomotive causes this electrical display, but in just what way is that which is still puzzling them.

GAS PRESSURE ALARM.—When two neighboring buildings are illuminated by gas derived from the same source it frequently happens that the extinction of the lights in one building causes the pressure of gas in the other to become greatly increased, and sometimes to result in accident. M. Launay proposes, as an alarm to give warning of this over pressure, a bisulphate of mercury battery, in which the liquid is in communication with the gas by means of a siphon, so that the pressure of the gas, in varying, raises or lowers its level. If the pressure is above a certain fixed limit, the liquid is raised so as to come in contact with the metallic portion of the battery, establishing a current which sounds an electric alarm. M. Launay also suggests that a simple method of determining leaks in gas pipes throughout a building is to force some strongly odorous smoke into the supply pipe. The fumes of incense, for example, escaping in any room, would be readily distinguished from gas, and the locality of the leak discovered.

PASIGRAPHY.—Pasigraphy is the name of a new system of writing by numbers, which, it is asserted, may be used universally, and thus obviate the difficulty of communication between nations of different languages. Dr. Anton Bachmaier, of Munich, is the inventor. A conference of gentleman of various nationalities was held in London not long ago to promote the undertaking, and the result is said to have been of an encouraging character.

Journal of the Telegraph.

This Journal is issued on the 1st and 15th of each month. Its circulation is over 8,000. It goes to every State, Territory and Province on the Continent. It has become a necessity, and is always welcomed as a friend. No better medium for advertising exists.

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TWO DOLLARS PER ANNUM IN ADVANCE.

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JOURNAL OF THE TELEGRAPH,

Western Union Telegraph Company,

145 Broadway, New York.

NEW YORK, JULY 15, 1874.

ELECTRO MOTORS.

Contrary to our custom we direct attention to an advertisement, which may be found in its proper place, offering a reward of five hundred dollars for a battery of given qualities for the use of the United States Electro Motor Company. This means business. The experiment of producing an economic motive power by the electric current is not abandoned. Enough is already known of its capacity to make a future extensive employment of it not only possible but probable. In a building not remote from where we write, a revolving magnet of 4 inches in diameter and $2\frac{1}{2}$ inches across the face, is pumping up 150 gallons of water per hour to a reservoir 36 feet high, at a cost of 2 cents per hour. This is a mere indication of the future of a power, free from all the elements of danger, which the wants of man in ten thousand ways ask science to provide. We have no doubt the battery wanted will be provided. The offer is made by gentlemen well known, who mean what they say, and who are directing experiments full of interest to the wide-awake civilization of our times.

AN EXCURSION OF TELEGRAPHERS.

On Wednesday, July 1st, a select party of gentlemen prominently interested in the telegraph, accompanied by many ladies, visited the cable steamer *Professor Morse* (formerly the *Suffolk*) belonging to the International Ocean Telegraph Company, for the purpose of inspecting the arrangements on board for laying and picking up of ocean cables, and to test the sailing qualities of the vessel. About 4 p. m. anchor was weighed, and a very pleasant trip was had to the broad Atlantic, a few miles outside of Sandy Hook, where a collation was served, after which the vessel returned to her anchorage in the stream, off the Battery, where she arrived at about 8.30.

The *Professor Morse* is a staunch iron vessel of 1,100 tons burthen, and is remarkably well fitted by build and equipment for the business in which she is now engaged.

DUPLEX TELEGRAPHY.

To prove the inaccuracy of the statement made in a recent number of the *Telegrapher*, that we claim every invention in Duplex Telegraphy for Mr. Stearns since the Western Union Telegraph Company acquired his valuable patents, we hereby disavow and disclaim for that distinguished inventor any right of prior invention in the latest discovery in duplex telegraphy contributed to that valuable journal, and published in the issue for July 4th, 1874.

This great invention, a description of which, accompanied by an elaborately executed diagram, was published in the issue above mentioned, aims at nothing less than the solution of the following difficult problem in duplex telegraphy; to wit: A permanent equation of the outgoing current upon the receiving relay at the sending station, without the necessity of adjustment.

This problem is supposed to be solved by signaling with two batteries, both having their positive poles connected to line, and their negative poles to earth, each battery having the same number of elements. In one of the battery wires leading to the line is inserted the receiving relay; in the other battery wire is inserted a resistance equal to that of the relay. The batteries are so arranged that they may be connected or disconnected by suitable devices.

It is supposed by the inventor, and, of course, sanctioned by the scientific editor of the before-mentioned critical journal, that when both batteries are connected to line, no current will pass through the relay, for the reason that any tendency in the battery connected to the relay to set up a current, is balanced by the opposing current from the battery connected with the resistance coil. Were the line open this suggestion would be correct, but as it must necessarily be closed to effect transmission, it is obvious that both batteries will act as independent feeders to the main line, or as a main battery connected in two series for quantity, and the relay will close precisely as if no equation was attempted.

Having thus disposed of the only original invention upon duplex telegraphy with which the *Telegrapher* has favored the telegraphic public, we here beg leave to remark, that thus far Mr. Joseph B. Stearns is the first and only man who has invented and put in operation a successful system of duplex telegraphy. We are not unmindful of the great efforts put forth in this direction by Gintl, Siemens, Frischen, Newhall, Hughes, Farmer, and other distinguished electricians and inventors. But as Mr. Stearns was the first, and thus far, the only person to practically solve this great problem, we have thought it no more than his due to accord to him his just claims.

Whenever any other person shall invent as good a duplex as Mr. Stearns', or shall make any original invention in duplex telegraphy, whether good, bad, or indifferent, if brought to our notice, we shall be happy to give such inventor his proper measure of credit.

ON THE CONSTRUCTION OF TELEGRAPHIC APPARATUS AND THE CHANGE IN ELECTRICAL TERMS.

We publish in another column a letter from Mr. De Bree, of Key West, in which he expresses his general dissatisfaction with telegraphic apparatuses, on account of "so many apparent defects that can be readily discovered by examination and experiment."

His first complaint is directed to that long-suffering member, the armature, as to which there has been, and is now, examination and experiment *ad infinitum*. Far be it from us to claim that perfection has been reached in any apparatus; yet it is true that the form of armature now generally used and manufactured by the Western Union Company is found, for general purposes, to be the best yet discovered on both theoretical and experimental grounds.

Of course, special kinds of work often require specially constructed apparatus, and it is quite possible that Mr. De Bree may have found magnets or armatures set to accomplish work for which they were ill adapted; but his vague paragraph on armatures hardly furnishes sufficient justification for the somewhat sweeping character of his opening paragraph, quoted above.

As to the Gravity Battery, we should be glad to have him point out the particular defects that "destroy the economical properties of the battery."

The condensers to which he alludes were made for duplex use only, and as for such use the immediate discharge only is required, it is not essential to secure so high a degree of insulation between the plates as would be requisite in a standard condenser to be used for testing purposes. An ordinary duplex condenser will lose a very considerable portion of its charge in 15 seconds. The capacity of the condenser in question was determined by comparison with a standard $\frac{1}{2}$ micro-farad, by Elliott Bros., London, made within the past year. If Mr. De Bree's observations are correct, some change has taken place in the condensers since their shipment. The test appears to have been made with a mirror galvanometer, although it is not stated what instrument was used, nor exactly what battery, but simply "that it had about one Volt tension." From the tests given condensers Nos. 7, 15, 20 and 22 appear to give deflections very nearly proportional to their marked capacities. Nos. 17 and 18 seem to have lost nearly all capacity, while the remaining 6 vary considerably from their proper figures.

Mr. De Bree's embarrassment as to the signification of the letters M. F. used in marking the condensers, arises from the change that has been made by the authorities on such matters in the use of the words farads and micro-farads. What was formerly designated as *farad* is now called a *micro-farad*. Latimer Clark (1868) gives the capacity of various cables as about $\frac{1}{2}$ farad per knot, while Culley (1874) gives the usual capacity of a cable as about $\frac{1}{2}$ micro-farad per knot. Reference to Prof. Jenkins' manual shows the adoption of the latter signification of the terms.

THE NEW CODE OF RULES.

The following directions to unskilled operators have been sent us, to form, if acceptable, a part of an operator's manual, should such a work be deemed necessary. They are written by one whose skill and experience give him facility in the work he has undertaken, and, we think, might be added with great advantage to the new code of rules. The two closing items are omitted for want of room.

We append the following note from one of our most observing and intelligent superintendents :

"These are very good. I see nothing to add or change. It might be advantageous, I think, to prompt to a study of electricity and a practical knowledge of the various instruments in use for telegraphing and for testing wires, batteries, &c. There is a sad deficiency in this respect, and every effort should be made to remedy it. Speaking of it once or twice has only a momentary effect. It is necessary to keep drumming at it."

Also the following from one of the best of our Western electricians :

"These instructions appear to me to be complete, and cannot easily be misunderstood."

INSTRUCTIONS TO OPERATORS AT WAY STATIONS.

OPENING THE KEY.

1.—Operators should never open the key without first turning the relay adjusting spring high enough to break the local circuit, in order to make sure that no one else is using the line; and, on calling another office, to have the relay so adjusted as to receive the response.

ARMATURES.

2.—Armatures of relays, sounders and registers, should be adjusted so that a piece of writing paper can be passed between the armature and poles of the magnet when the circuit is closed. This distance should not be increased except in the case of the relay when the condition of the line's insulators requires a wider separation.

WAY OFFICES CHANGING WIRES.

3.—Way offices should never put instruments on wires they do not usually work, without instructions from the chief operator in charge of the circuit. Putting in relays without orders may vitiate the results of tests being made, and if the wire be in use for the duplex instrument, the addition of another relay may, by its added resistance and induction, disturb the working of the circuit.

OBEYING ORDERS.

4.—When ordered by the chief operator to make any changes in the wires, the orders should be at once obeyed. In case anything occurs which prevents the carrying out of the order, the person who gave it should be notified at once.

CARE OF MACHINERY.

5.—Managers of way offices must examine and tighten up all screwposts in switches and instruments *daily*; the drying and warping of the wood in which they are fastened, and the jar of passing trains, will loosen them if they are not carefully attended to. This daily inspection should never be omitted. Instruments should be covered at night, and kept free from dust.

PLATINA POINTS.

6.—Platina points in relays and keys, the latter especially, become oxydized and fail to connect

properly. To cure this, scrape the points, but not too frequently, and only when necessary, with a fine file or knife. Rubbing paper or pieces of wood between the points will not remove the trouble. Watch oil has been recommended as a desperate remedy, but it should never be used, as it soon becomes foul and increases the evil it was designed to cure.

TAGGING WIRES.

7.—Line wires, where they enter the switch, and all office connections where needed to be traced quickly, must be tagged with the number or name of the wire and the direction in which it runs. The switch-board must be kept scrupulously clean.

DIRECTIONS FOR TESTING.

8.—The main line circuit is composed of the main battery, relays and keys, line wire and the earth. In the diagram, the course of the current may be traced by supposing it to start from the main battery, at the left hand, up through the key and relay, through lightning arrester, to the line; thence along the line wire to the lightning arrester at the intermediate office, through the relay and key, out to line again, to the terminal office in the right hand of the diagram, where it passes through arrester, relay, key and battery to the ground, and then goes through the earth back to the other pole of the battery from which it started.

The local circuit is confined to the office, and is composed of the local battery, relay frame and armature lever, sounder, and the office wire which connects these together.

OPEN CIRCUIT.

9.—'No current' on the line is indicated by the relay magnet failing to attract its armature. Either the line wire is broken, or the batteries at the terminal offices have like poles to the line, or a ground cuts off the main battery, or the leading in wires are crossed, or a key has been left open. When the line is broken, the application of a ground wire at an intermediate office will close the circuit and make the relay attract its armature when that portion of the line in which the break is situated is cut off by the ground wire. When putting the ground wire on the eastern side of the instruments causes the instruments to work, the break is east of the office testing, and the current from the western battery returns to earth through the ground wire at the testing office. In case the application of the ground wire gives no current either way, the line is either broken on both sides of you, or else is open in your office. As the latter is the most likely to occur, always suspect trouble to be there, and proceed as follows: First open your key, and having moistened the forefinger of each hand place them on the line wires where they enter switch. If you feel the current, the trouble is in your office. It will usually be found in a loose screwpost (either in switch or relay); in the screws that fasten the wires to the legs of the key, under the table; in loose or dirty circuit-breaker of key, in the fine wire under the base of the relay used to connect the screwposts with the coils of the instrument; in an imperfect connection made by a loose button or plug in the switch, or in the flexible wire used to connect the instruments to the switch. If found in neither of these places, which are easily accessible, and can be examined in less than a minute, the trouble will be found in the office wire that connects the instruments together, in which case a more careful search will probably reveal the cause of the trouble.

If the circuit be open, and putting a ground on either east or west closes it, the terminal batteries

have similar poles to the line. When this is the case, keep the ground wire on long enough to raise, and notify one of these offices that his battery is reversed.

If the leading-in wires be crossed, the symptoms will appear to you the same as though the batteries were reversed; but in this case you will probably be informed by one of the terminal offices that the batteries are O. K. Then look for trouble in the loop from the line to the switch, and in the wire between the switch and relay.

If you have but one wire in your office, and the lines open, put on a ground wire, call up the terminal office, and notify him of the trouble immediately. This duty is very important, and should never be neglected. Do not keep the ground wire on unless ordered to do so by the chief operator, but put it on occasionally to send a message, or to make sure no one else has a message for you.

LINES CROSSED.

10.—Crossed wires are indicated by the lines in trouble working together, so that writing sent on one wire returns on the other, more or less completely. A way office can locate a cross by having other offices on the wire open it in turn while he writes on the other. The cross is located between the two contiguous offices, one of whom, by opening the wire, causes the writing sent on the other to disappear; and the other of whom, opening the wire, has no effect on the writing passing through the cross. The cross is, in the first place, decided to be east or west of the office testing by noticing from which side the writing from other offices seems to most interested by the trouble. A way office, having two or more wires passing through it, will be frequently called upon by the terminal offices to open a wire, and say when open. This service should be performed promptly, and the line should not be reported open until it actually is, and when closed, it should be reported closed in the same manner. If the line wires in the office touch each other, or a piece of metal, or a damp wall or board, separate them carefully, and remove them from any substance they may touch, as either of above causes may produce an interruption.

ESCAPE OR GROUND.

11.—In wet weather all air lines are subject to some escape, which is usually equally distributed over the whole line. All that is necessary to do in this case is to adjust the relay spring higher for distant offices, and lower for those that are nearer. It may be necessary also to separate the coils further from the armature, if the tension of the spring fails to secure action. In case the escape is so heavy that it can be worked over with difficulty, or not at all, it must be tested for in the following manner: The current will traverse the fault, and go to the earth through the leak, and thence back to the battery, even if the keys beyond the escape be open. So an escape is readily located by requesting offices to open their keys in turn, and adjusting down to see if there is any current on the line while the key is opened. A way office having 2 or more wires passing through, will frequently be requested by the chief operator at a terminal office to open a wire while he tests for escape. Proceed as described in *Lines Crossed* until he tells you to close it. If you have only one wire in your office, open the key the period of time requested, and then close it. The escape may be in your office, caused by line wire, switch, or instruments touching moist or metallic substance connecting with the earth. Examine office connections carefully if the trouble is near your office.

CONSTRUCTING ELECTRO-MAGNETS.

A correspondent of the *English Mechanic* describes a new form of electro-magnet constructed by him, which, he claims, is much superior in its effects to those of the ordinary construction. A number of pieces of iron wire, of No. 16 gauge and twelve inches in length, are each wound with fine insulated wire, commencing half an inch from one end and winding closely for $2\frac{1}{2}$ inches towards the centre, and then going with two or three long turns to a point three inches from the opposite end, which is wound in the same manner as the first, leaving the ends of the wire long for subsequent attachment. The wire thus covered was dipped in spirit varnish and laid away to dry. A number of them were afterwards bent into the form of a horseshoe and surrounded in the bundle with a number of pieces of similar No. 16 iron wire, but not covered. The whole was then wound in the usual manner with eight layers of No. 16 insulated copper wire, to which all the ends of the inside wire were soldered. The magnetic effect is stated to have been surprising.

TO ELECTRICIANS AND INVENTORS.

OFFICE OF THE UNION ELECTRO MOTOR CO., }
62 BROADWAY, NEW YORK, July 8, 1874. }
The attention of Electricians and Inventors is invited to the following proposition: The

UNION ELECTRO-MOTOR COMPANY

desire to procure a

GALVANIC BATTERY

fulfilling the following requirements:

1. It must be capable of maintaining a steady current of 6 farads per second through a resistance, external to the battery, of two-tenths of an ohm, with not more than six pairs of plates. This is, approximately, equal to the current developed by 3 of Chester's No. 2 carbon cells, charged with mixed nitric and sulphuric acid in the porous cells through 50 feet of No. 18 copper wire, .049 inches in diameter.
 2. It must be absolutely free from fumes, and from liability to leak or spill its contents under any ordinary circumstances. If possible, it is desirable that a battery should be provided to work without liquids—in other words, a dry battery.
 3. It must be capable of standing for a considerable length of time unused without material depreciation, and yet be ready to give out its full power at a moment's notice whenever required.
 4. It must be self-supplying to an extent which will render it capable of furnishing a current, as above stated, for not less than 300 hours in succession without renewal.
 5. Other things being equal, preference will be given to the battery occupying the smallest space.
- For the best battery fulfilling the requirements herein specified a premium of

FIVE HUNDRED DOLLARS

will be paid, in accordance with the decision of the judges, if the battery is adopted by the company—which shall also have the privilege of exclusive ownership by paying the additional sum of

FIFTEEN HUNDRED DOLLARS.

This offer will remain open until November 1, 1874.

Judges.—MARSHALL LEFFERTS, President of the Gold and Stock Telegraph Company; GEORGE B. PRESCOTT, Electrician of the Western Union Telegraph Company, and FRANK L. POPE, Electrician.

E. B. GRANT, President.

H. H. DUNCKLEE, Secretary.

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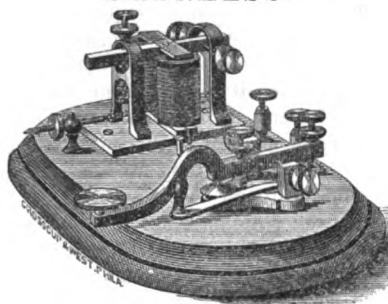
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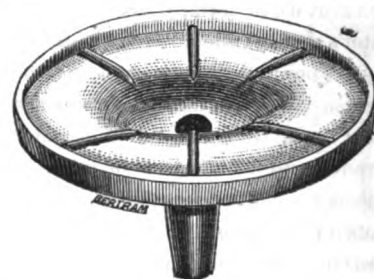
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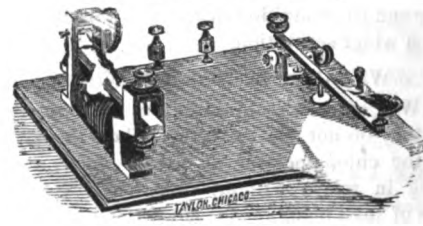
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JOURNAL OF THE TELEGRAPH.

VOL. VII. NO. 15.

NEW YORK, AUGUST 1, 1874.

WHOLE NO. 162.

THE THOMSON GALVANOMETER.

By H. R. KEMPE.

The accuracy with which measurements can be made depends chiefly upon the sensitiveness of the galvanometer employed in making these measurements. The Thomson reflecting galvanometer supplies this requisite sensitiveness, and is the instrument which is most invariably employed when great accuracy is required, and also when very high resistances have to be measured. Its principle is that of employing a very light and small magnetic needle, delicately suspended within a large coil of wire, and of magnifying its movements by means of a long index hand of light. This index hand is obtained by throwing a beam of light on a small mirror fixed to the suspended magnetic needle, the ray being reflected back on to a graduated scale. This scale being placed about 8 feet distant from the mirror, it is obvious that a very small angular movement of the mirror will cause the spot of light reflected on the scale to move a considerable distance across it. The needle of the instrument being very small, and being placed in the centre of a large coil, the tangents of its deflections are directly proportional to the strength of the currents producing them.

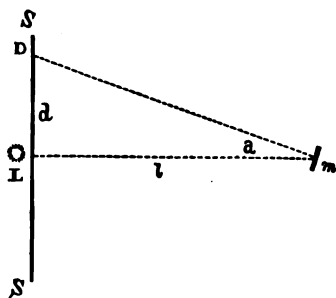


Figure 1.

In Fig. 1 let L be a lamp which throws a beam upon the mirror, m , which has turned through a small angle, and reflected the beam on the scale at D . Let d be the distance through which the beam has moved on the scale from the zero point at I , and let l be the distance between the scale and the mirror. Now the angle through which the beam of light turns will be twice the angle through which the mirror turns. This is clear if we suppose the mirror to have turned through 45° , when the reflected beam will be at 90° , or at right angles to the incident beam. If, then, we call a the angle through

which the beam of light turns, $\frac{a}{2}$ will be the angle through which the mirror will have turned. Let $\frac{a_1}{2}$ and $\frac{a_2}{2}$ be the two angles through which the mirror has been turned by two currents, of strengths s_1 and s_2 , respectively, then—

$$s_1 : s_2 :: \tan \frac{a_1}{2} : \tan \frac{a_2}{2}$$

therefore—

$$s_1 : s_2 :: \frac{\sqrt{1 + \tan^2 a_1} - 1}{\tan a_1} : \frac{\sqrt{1 + \tan^2 a_2} - 1}{\tan a_2}$$

$\sqrt{1 + \tan^2}$ being positive, as the angles are less than 90° .

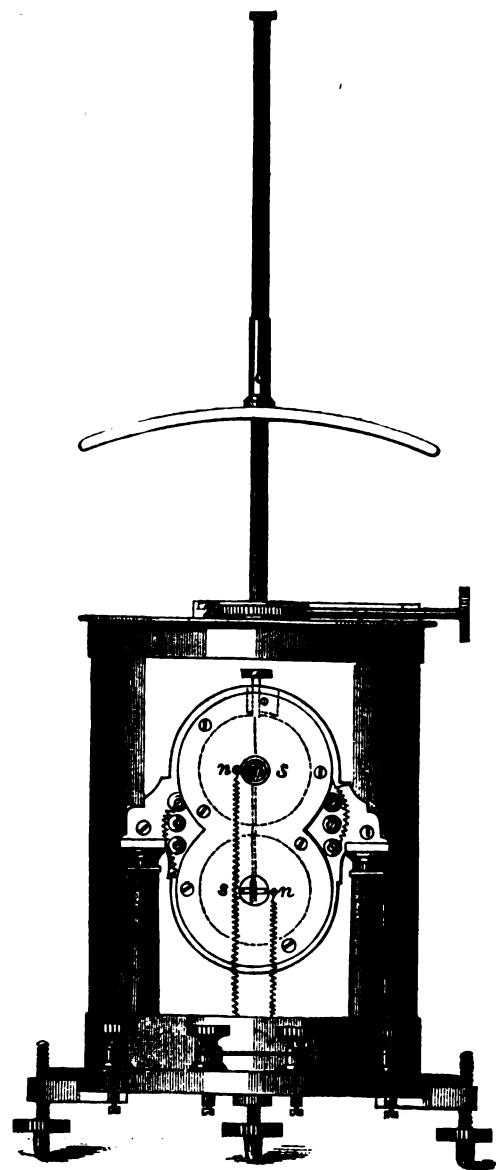


Figure 2.

s being the distance of the scale from the mirror, let d_1 and d_2 be the distances traversed on the scale by the beam of light, then—

$$\tan a_1 = \frac{d_1}{s}, \tan a_2 = \frac{d_2}{s},$$

therefore—

$$s_1 : s_2 :: \frac{\sqrt{1 + \frac{d_1^2}{s^2}} - 1}{\frac{d_1}{s}} : \frac{\sqrt{1 + \frac{d_2^2}{s^2}} - 1}{\frac{d_2}{s}},$$

therefore—

$$s_1 : s_2 :: d_2 (\sqrt{1 + \frac{d_1^2}{s^2}} - 1) : d_1 (\sqrt{1 + \frac{d_2^2}{s^2}} - 1);$$

when d_1 and d_2 do not differ largely, then we may take—

$$s_1 : s_2 :: d_1 : d_2,$$

but when this is not so the error may be considerable. For instance, suppose $s = 400$, $d_1 = 150$, and $d_2 = 300$. According to the above formula this would show that one current is just twice as strong as the other, but according to the correct formula we find—

$$s_1 : s_2 :: 300 (\sqrt{1 + \frac{150^2}{400^2}} - 1) : 150 (\sqrt{1 + \frac{300^2}{400^2}} - 1),$$

that is—

$$s_1 : s_2 :: 8100 : 15000,$$

or—

$$s_1 : s_2 :: 150 : 278,$$

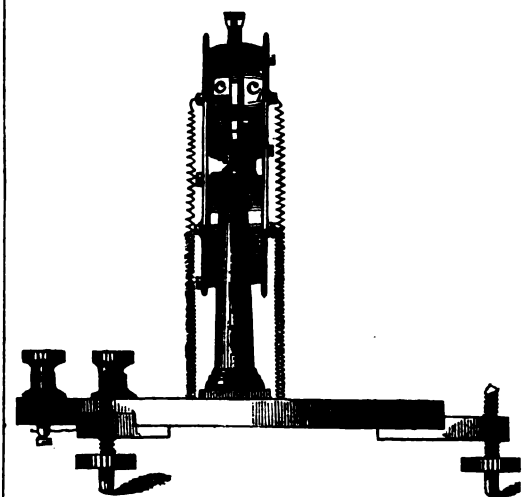


Figure 3.

so that when extreme accuracy is required we cannot take the strengths of currents as being proportional to the number of divisions of deflection on the scale.

The galvanometer, as usually constructed, consists essentially of a very small magnetic needle, about three-eighths of an inch long, fixed to the back of a small circular mirror whose diameter is about equal to the length of the magnet. This mirror, which is sometimes a plano-convex lens of about 6 feet focus, is suspended from its circumference by a single cocoon fibre devoid of torsion, the magnetic needle being at right angles to the fibre. The mirror is placed in the axis of a large coil of wire, which completely surrounds it, so that the needle is always under the influence of the coil at whatever angle it is deflected to. A beam of light from a lamp placed behind a screen, about 8 feet distant from the coil, falls on the mirror, the bottom of which is slightly in advance of the top, and is reflected back on to a graduated scale placed just above the point where the beam emerges from the lamp. The screen is, as we have before said,

straight, and is graduated usually to 360 divisions on either side of the zero point.

The Thomson galvanometer is made in such a variety of forms that it will be impossible to describe them all; we purpose therefore only to describe one very common form in use.

Fig. 2 is a front view, and Fig. 3 is a side view (with glass shade, &c., removed), of this form, one-third full size. It consists of a base formed of a round plate of ebonite, provided with three levelling screws; two spirit levels, at right angles to one another, are fixed on the top of this plate, so that the whole instrument can be accurately levelled. Sometimes one circular level only is provided, but the double level is much the best arrangement. From the base rise two brass columns, and between them a brass plate is fixed, rounded off at the top and bottom. Against the faces of this plate are fixed the coils (*c, c, c, c*) of the instrument. The brass plate has shallow countersinks in its surface for the faces of the coils to fit into, so that they can be fitted in their correct places without trouble or danger of shifting. Round brass plates press against the outer surfaces of the coils by means of screws, and keep them firmly in their places. There are two round holes in the brass plate coinciding with the centre holes in the coils. The coils themselves, which are four in number, as will be seen in the figure, are wound on bobbins of thin material, the wire being heaped up towards the check of the bobbin which bears against the brass plate. This heaping up is done in accordance with the law of Sir William Thomson, so as to obtain, as far as possible, a maximum effect out of a minimum quantity of wire. The edges of the coils are covered with shellac, so as to protect the wire from mechanical injury. Within the holes in the brass plate are placed two little magnets, *n s* and *s n*, formed of watch-spring highly magnetized. They are connected together by a piece of aluminium wire, so as to form an astatic pair of needles. A small groove is cut in the brass plate, between the upper and lower hole, for the connecting aluminium wire to hang freely in. In front of the top needle is fixed the mirror. The suspension fibre is attached, at its upper end, to a small stud, which can be raised or lowered as required. When pressed down as far as it will go the needles rest on the coils, and the tension is taken off the fibre, so that the instrument can then be moved about without danger of breaking the fibre. One end of each coil is connected to one of the four binding screws in front of the base of the instrument, the other ends being connected to one another through the medium of the little binding screws placed midway on either side of the coils. The connections are so made that when the two middle binding screws on the base of the instrument are joined together, the whole four coils are in the circuit of the two outer binding screws, so that they all four act on the magnetic needles. Some better arrangement for connecting the four coils together than that at present adopted is highly desirable, so that they can be coupled up in series, by which means the resistance of the galvanometer could be reduced to one-fourth the resistance of one of the coils, that is, one-sixteenth of that of all the coils together. By connecting the first binding screw on the base with the third, and the second with the fourth, the coils will be coupled up so as to reduce the resistance of the coils to one-fourth of the total resistance of all the coils together. Over the coils a glass shade is placed from the middle of the top of which a brass rod rises. A short piece of brass tube slides over this rod with a weak steel magnet slightly curved fixed at right angles to it. This

magnet can be thus slid up or down the rod, or twisted round as occasion may require. For fine adjustments a tangent screw is provided, which turns the brass rod round and with it the magnet.

We have said that the mirror is sometimes made of a plano-convex lens. This is done so as to obtain a sharp image of the spot of light on the scale. The width of this spot of light can be regulated by means of a little brass slider fixed over the hole in the screen through which the beam emerges from the lamp. A much better arrangement than the spot of light is made with some instruments. The hole through which the light emerges is made round, about the size of a sixpence, with a piece of fine platinum wire stretched vertically across its diameter. A lens is placed a little distance in front of this hole, between the scale and galvanometer, so that a round spot of light with a thin black line across it is reflected on the scale. This enables readings to be made with great ease, as the figures on the scale can be very distinctly seen. The mirror in this arrangement may be a plane one. When the spot of light only is used, it is necessary to partially illuminate the scale with a second lamp.

To set up the Galvanometer.—It is essential before proceeding to set up the instrument for use to see that the ebonite base is thoroughly dry and clean, so that there may be no leakage from the wires to interfere with the tests taken. Indeed, it is as well to place the galvanometer and the other apparatus to be used on a large sheet of gutta-percha or ebonite, more especially if the room in which the tests are to be made is at all damp. Sometimes little ebonite cups are provided for the levelling screws of the instrument to stand in, which answers the purpose of insulating very thoroughly.

The instrument should be set up on a very firm table in a basement story. It is almost useless to test with it in an upper room, as the least vibration sends the spot of light dancing and vibrating to and fro. At all cable works the instrument is placed on a solid brick table built in the earth, so that no vibration can possibly affect it.

A suitable table being chosen, place the galvanometer so that the two front levelling screws stand north and south, the front facing west. This is best done by drawing a line on the table exactly north and south, and placing the levelling screws on it. The levelling screws are then adjusted until the bubbles of the level or levels show the instrument to be perfectly level. Now remove the glass shade and gently raise the stud at the top of the coils. This should be done by squeezing the tips of the fingers between the bottom of the head of the stud and the top of the brass plate in which it runs. If the stud is raised by a direct pull there is almost a certainty of its coming up with a jerk and breaking the fibre. On no account must the stud be twisted round, except to get rid of any torsion which may exist in the fibre when it has to be replaced after becoming broken. The stud being raised sufficiently high to allow the mirror to swing clear of the coils, the glass shade may be replaced and the brass rod with the magnet on it screwed on to its top and the magnet placed about half way up the rod, the poles being placed so as to assist in keeping the magnetic needles north and south. The scale lamp being lighted, place it in its proper position on the scale stand, the edge of the wick being turned towards the brass slider regulating the width of the beam of light. The slider being opened to its full extent, the scale and lamp should be placed about 8 feet from the galvanometer, so that it stands parallel with the faces of the coils, and also so that a line drawn at right angles to the scale from the lamp hole will pass

through the centre of the galvanometer. The reflected beam of light should then fall fairly on the scale. If too high, this may be remedied by propping up the scale, and if too low, by screwing up the levelling screws of the galvanometer.

It is easier to prop up the scale than to lower the galvanometer by means of the levelling screws, if the light is too high on the scale.

The spot of light being obtained at the zero point on the scale by turning the regulating magnet of the galvanometer by means of the screw, the spot of light should be focussed by advancing or retreating the lamp and scale until a sharply defined image is obtained on the scale; the width of the slit may then be diminished by means of the brass slide until a thin line of light only is obtained on the scale. If the round spot of light with the line across is used, the focussing must be made so that the black line of light is sharply defined.

The position of the scale and galvanometer being once defined, their positions on the table may be marked for future occasions or at least the exact distance of the scale from the galvanometer noted, so that it can be placed right when required without trouble. The instrument is now ready for use. If not required to be sensitive, place the regulating magnet low down; if, on the contrary, it is required to be sensitive, place it high up. To obtain its maximum sensitiveness the following device must be adopted:—Raise the magnet to the top of the bar, and when there turn it half round so that its poles change places. The magnet will now be opposing the earth's magnetism, and consequently will tend to turn the magnetic needles round. If the magnet is at the top of the rod, the effect of magnetism of the earth on the magnetic needles will be more powerful than the magnetism of the regulating magnet, and the needles will tend to keep north and south; but by lowering the regulating magnet a point is reached where its magnetism just counteracts the earth's magnetism. Under these conditions the needles will stand indifferently in any position. By placing the regulating magnet about an inch higher than the position which gives this exact counteraction, the magnetism of the earth will be just sufficient to keep the magnets north and south, and consequently the spot of light at the zero on the scale, and at the same time, leaves them free to be moved by a very slight force. It will be noticed with the regulating magnet in this position, that in order to get the spot of light at the zero point, the magnet must be turned in the opposite direction to that in which it is required that the needles should move.

It is not advisable to adjust the instrument too sensitively, because it is difficult then to keep the spot exactly at zero, as any slight external action may throw it a degree or two out.—*Telegraphic Journal.*

CUBA SUBMARINE TELEGRAPH.

At an extraordinary general meeting of the Cuba Submarine Telegraph Company, recently held in London, the Chairman said the vessel which had been sent out in December last to repair the break in the cable had accomplished that object. The cost of the repairs and hire of the vessel had been £30,500, in addition to which the company had lost about six months' traffic, which might be estimated at from £12,000 to £13,000. To prevent the risk of a similar loss of traffic in the future the directors had decided on the construction and laying of a duplicate cable. There was also the necessity for a second cable to accommodate the largely-increasing traffic with the West Indies and South America.

SANCTITY OF TELEGRAMS.

An unpleasant affair has occurred in Buffalo; a telegram intended for the evening papers having by some means come into the possession of the *Morning Express*, and been published by it before it reached its rightful owners. The *Express* neglected or refused to make any explanation, and the matter being brought to the attention of Hon. William Orton, President of the Western Union Telegraph Company, he ordered an investigation to be made. His letter of instruction to the company's Buffalo attorneys is as follows:

EXECUTIVE OFFICE,
WESTERN UNION TELEGRAPH COMPANY,
NEW YORK, July 18, 1874.

Messrs. Bowen & Rogers, Counselors, Buffalo, N. Y.:

I desire your assistance in respect of the matters following: On the 5th of July inst., a message was received at our Buffalo office addressed to the *Courier* and *Commercial* newspapers. The contents of this message were published in the Buffalo *Express* on the morning of July 6. It is reported to me that a person claiming to be a reporter of the *Express* obtained access to the message of the *Courier* and *Commercial* by false representations made to a person in the employ of this company. On the other hand, it is denied that any misrepresentations were made by the *Express* reporter, which implies that a person in the employ of this company willfully divulged the contents of a message by which injury was done to the parties to whom the message was addressed. It is important for the interests of the company and for the protection of the public who are its customers that the facts should be carefully ascertained. If any person in the employ of the telegraph company has been guilty of so gross a breach of trust and so flagrant a violation of law as to divulge the contents of a message without the consent of the persons to whom it was addressed, he should be dismissed and punished. If, on the other hand, a person known to be connected with a leading newspaper has, by dishonorable means, obtained access to the messages in our custody belonging to other newspapers, has copied and published the contents thereof, then he also should be exposed, and punished if possible.

Will you do me the favor to conduct an inquiry with a view solely to ascertain the facts in this case? The employes of the company at Buffalo will submit themselves for examination, and I also desire that opportunity be afforded the reporter of the *Express*, and any other parties connected with either of the three papers named, to be heard on the subject.

Please advise, also, if chapter 871, laws of 1867, is applicable to this case. Very respectfully,

WILLIAM ORTON.

The following is the result of the investigation:

OFFICE OF BOWEN, ROGERS & LOCKE,
COUNSELORS-AT-LAW,
BUFFALO, July 23, 1874.

WILLIAM ORTON, Esq., President Western Union Telegraph Company:

Upon the receipt of your letter of July 18th, we gave notice to the proprietors of the *Commercial*, *Express* and *Courier*, that we would commence the examination on Wednesday at three o'clock.

The *Commercial* and *Express* were represented on the hearing. The *Courier* did not appear.

We have examined the boy in the telegraph office, and also the reporter of the *Express*, and Mr. Berry, who has charge of the local columns of the *Express*.

We enclose a copy of their examination. From this examination we think there is no doubt that the special dispatch from Messrs. Albro and Chester addressed to the *Courier* and *Commercial* was procured by the *Express* reporter from the office boy in your office by falsely representing that the *Express* was entitled to it, and that it was so procured without the consent of the proprietors of either the *Courier* or *Commercial*.

The first section of Chapter 871 of the Laws of 1867 reads as follows:

"If any person shall willfully open, read, or cause to be opened or read, any sealed letter or telegraphic dispatch or message not addressed to himself, without the permission of the person to whom it shall be addressed, or of the writer thereof, or other person having the right to give such permission, he shall, upon conviction thereof, be adjudged guilty of a misdemeanor, and shall be punished by a fine of not less than three hundred dollars, or imprisonment not less than three months, or both such fine and imprisonment. And any person who shall aid, abet or encourage the opening or reading of any such letter, telegraphic dispatch or message, shall be deemed guilty of a misdemeanor, and, upon conviction, shall be punished as herein above provided."

We think under this section that the *Express* reporter is liable to indictment and conviction. That he did "willfully read" a "telegraphic dispatch or message not addressed to himself" or his employers, "without the permission of the persons to whom it was addressed, or the writers thereof, or other person having the right to give such permission," there can be no doubt.

The second section of the Act reads as follows:

"Any person connected with any telegraph company in this State, either as clerk, operator, messenger, or in any other capacity, who shall willfully divulge the contents or the nature of the contents of any private communication entrusted to him for transmission or delivery, or who shall willfully refuse or neglect to transmit or deliver the same, shall, on conviction before any Court, be adjudged guilty of a misdemeanor, and shall suffer imprisonment in the county jail or workhouse in the county where such conviction shall be had, for a term of not more than three months, or shall pay a fine not to exceed five hundred dollars, at the discretion of the Court; and any person who shall willfully, by connivance with any clerk, operator, messenger or other employé of any telegraph company or otherwise, willfully and wrongfully obtain, or attempt to obtain, any knowledge of any telegraphic message or dispatch, communication or communications, while the same shall be in course of transmission, without first having the assent and authority of some person having the right to give such assent and authority, shall be deemed guilty of a misdemeanor, and shall, upon conviction, be punished by a fine of not more than one thousand dollars, or imprisonment for not more than three months, or by both such fine and imprisonment."

We do not think from the statements that your boy was guilty of "willfully" divulging the contents of the dispatch. He believed the statement of the *Express* reporter that the *Express* was entitled to the dispatch.

Very respectfully,
BOWEN, ROGERS & LOCKE.

ELECTRICITY PRODUCED IN MECHANICAL ACTIONS.

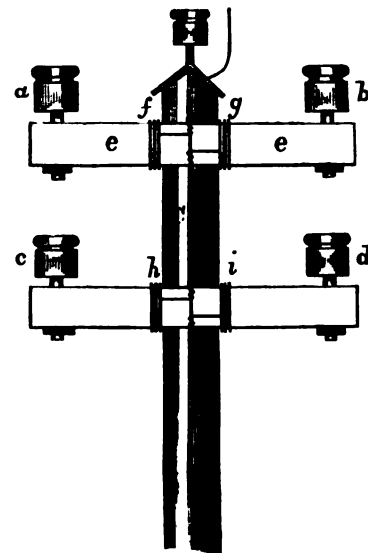
Certain phenomena of electricity of tension, observed in leather belting by M. Joulin, have recently been the means of directing the attention of that physicist to the subject forming the above heading. He has constructed machines in which the mechanical tension of the belt can be varied at will, and has used for conducting pulleys the following materials: Iron, brass, zinc, red copper, white iron, lead (the last four metals applied in thin laminæ to wooden pulleys); the imperfect conductors, walnut wood, leather, hardened rubber, in sheets of 0.36 inch, applied to wood; cloth and silk fastened in form of cushions, also to wooden pulleys.

In the machines formed of metal and leather, in the latter body electric tensions of surprising intensity were found. Independently of the long sparks obtainable, a metallic wire brought near the belt was traversed with a continuous current powerful enough to deflect the needle of a galvanometer, with electricity of tension to weakly decompose water, and in slightly modified Geissler tubes to produce a distinct stratification of the electric light. The circumstances influencing the electric production may be referred to three causes—separation, more or less rapid, of the bodies; the complex mechanical action of incurvation, depending, in the case of leather, on the elastic state and dimensions of the pulley, and the number of incurvations in a given time; lastly, the common temperature of the two bodies, or that of one of them.

The JOURNAL OF THE TELEGRAPH of March 16, 1868, contained the accompanying illustration showing the mode in which telegraph poles are provided with earth wires or contact conductors for carrying the wet weather escape directly to the earth, instead of permitting it to leak into the neighboring wires, and also serving the purpose of lightning rods. The earth wire consists of a piece of No. 8 galvanized iron wire, extending from the top of the pole to the bottom (fastened to the pole by iron staples), and terminating in a flat coil containing about twelve feet of wire, attached to the foot of the pole, so as to expose as large a surface as possible to the earth. From the earth wire, branches composed of No. 10 galvanized iron wire, are carried in saw-grooves sunk in the cross-arms. The earth wire also projects above the top of the pole about six inches.

Any current escaping from *a* along the wet arm *e*, on arriving at *f* finds a good easy channel down the wire *C* to the ground.

Any electricity which may pass *f* is arrested at *g*, *h* or *i*, and taken away before disturbing the working of *b*, *c* and *d* by getting into these circuits.



For several years past many of the poles of the Western Union Company have been provided with earth wires with the most satisfactory result. This has been particularly apparent in the West, and especially upon the plains and prairies, where every lightning storm formerly shattered and destroyed more or less of our poles, but which are now fully protected by a conductor placed on every fifth pole. In view of the beneficial results which have followed the employment of these earth wires upon our poles, it has been decided to largely extend their use.

CORRESPONDENCE.

NEW YORK, July 6, 1874.

To the Editor of the Journal of the Telegraph:

"Operator," in Stanhope, N. J., wishes data concerning the "Secular and Daily Variations of the Needle." If I can be of service with the following, partly taken from the German, partly my own experiments, please give it room in your columns:

Neither of the three factors of earth—Magnetism, Declination, Inclination or Intensity remain always the same. They are subject to a continuous change as far as they depend on different proportions of light, heat and electricity, and in the same proportion as latter are distributed in the earth, they will cause a variation of the needle.

It is necessary to observe and compare these variations, from time to time, and in different localities, to ascertain a law for this dependence. 'Tis true, science has accomplished in this matter but little more than to give us a list of its observations, but when we look upon the great number of magnetic stations in India, in the vast territories of the Chinese Empire, on the South-Sea Islands, Greenland, Cape of Good Hope, and in the laboratories of European and American Universities, and see the progress, the time and labor that is spent, we must admit that there is nothing left unmoved to solve the interesting problem. A very plain little instrument, the magnetometer, will be seen in the hands of every scientific traveler. With the aid of this they've found the gradual declination for different localities. In Paris, for example, in 1580 it was $11^{\circ} 30' E.$; 1618, 8° . In 1663 the astronomic meridian was identical with the magnetic. A hundred years later the needle declined $W. 8^{\circ} 10'$; 1780, $17^{\circ} 55'$; 1805, $22^{\circ} 5'$; 1814, $23^{\circ} 34'$. From this date it returns again, and in 1852 the angle was but $20^{\circ} 22' W.$, &c. These slow changes are called secular variations, and extend all over our planet.

Besides this secular movement we perceive another regular oscillation, which seems to be dependent on the seasons of the year, and another on the time of day or night, (Daily Variations.) I had a very sensitive needle in my office (Middle-Europe, about 47° N. lat., and 19° E. long.) and found that this oscillation reaches its most easterly point at about 8 A. M.; then it turns W. very lively until 2 P. M., then returns to its former position, moving more rapidly during the hours of the day than at night. "Si."

To the Editor of the Journal of the Telegraph:

I notice in your paper of July 1st, a question concerning the easiest, safest and quickest way of repeating messages. It is, in my opinion, a case without a question. There is not an operator in Christendom competent of comparing two messages to see if they are exact copies; he will on an average make a dozen mistakes in a week. It takes at least two minutes to compare the copies and fasten them together, during which time the circuit remains open. Again, as much paper will be wasted as is now used, besides the waste of time. No competent operator can make a mistake by the system of underlining each word as it is repeated—any difference can be detected undoubtedly. I have known several serious accidents caused by train dispatchers comparing an understanding of an order with the original, one of which caused from my own hand; but now all train dispatchers underline the words as they are repeated, and I have yet to hear of an accident occasioned by it. There is but one way, which is the right way.

E. F. G., Train Dispatcher.

To the Editor of the Journal of the Telegraph:

Would an operator be held responsible for any mistakes made in receiving messages from students?

On some of the lines running in this office there are many students; indeed, nearly every small office on the lines seem to have from one to three students, and the way they murder "gerse" is a caution.

We have to take business from them, as they are often left in charge of the office, and it is almost impossible to get anything from or to them. Very lately, one of them sent a message three different ways, and when the operator came in he sent it still another way. The question very naturally arises, who would be responsible for errors in such cases? Should students be allowed to send messages before they are competent to send correctly? CHAS.

Answer.—Students should not be allowed to send messages before they are competent. Report the whole facts to your superintendent.

To the Editor of the Journal of the Telegraph:

PENSACOLA, July 10th, 1874.

Will you please answer these questions through your columns?

- 1st. Is lightning positive or negative electricity?
- 2d. And is there any possible means to construct a battery as powerful as lightning?

GALE.

Answer.—1. Sometimes positive and sometimes negative. 2. Yes, by using a sufficient number of cells.

LANDING OF THE NEW ATLANTIC CABLE.

The shore end of the new Atlantic cable has been safely landed at Rye Beach, N. H., and the splice made to the deep sea section. The manner of splicing was as follows: The outer and protective coat of wires, twelve in number, and each composed of two wires wound together, were first unwound from each section of the cable, then a deep winding of tarred and prepared oakum, which exposed another roll of eleven wires, was unwound. Beneath these is another winding of oakum, which covers a solid gutta percha case of three layers, enclosing the main conducting wire of seven strands of very fine copper wire. When the wire was laid bare at the end of each section, the gutta percha being cut away about two inches, each wire was filed down so as to shape them for jointing. They were then laid together, and wound with extreme care with fine copper thread, and over this melted gutta percha was carefully dropped and rolled. The successive covers were then wound and connected, care being taken to avoid more than one covering at the same point.

WRECK OF THE CABLE STEAMER GOMOS.

The following details of the loss of the cable steamer *Gomos* off the coast of Brazil, are to hand:

"The British steamer *Gomos*, engaged in laying the telegraph cable on the southern coast of Brazil, has been wrecked with about one hundred miles of cable on board, though no lives were lost. This disaster will postpone through cable communication with the River Plate for six months longer, as she was landing an end at Rio Grande du Sol, for the purpose of laying the cable between that city and the frontier of Uruguay, when she was lost, and with her the cable intended for that last wanting link. It is also reported that the cable on the Uruguayan coast has parted. On the other hand, the Uruguayan land lines have reached within twenty miles of the Brazilian frontier, and should join on with the Rio Grande lines by July; but the Brazilian lines, whether government or private, are proved so unreliable that little account is made of them."

ASSESSING THE CAPITAL STOCK OF CORPORATIONS.

The opinions of the Supreme Court of Illinois in the important revenue cases argued before it last January have been filed. The questions involved were concerning the assessment of capital stock of corporations by the State Board of Equalization; whether the law prescribing this mode of assessment is constitutional, and whether the rulings and action of the State Board of Equalization, in making such assessment have been in accordance with the law. On both points the assessment of the capital stock of corporations by the State Board of Equalization is sustained in all cases, except that of the Western Union Telegraph Company, in which case the assessment is set aside, because the Revenue law creating the State Board and defining its powers says it shall assess the capital stock of all companies "now or hereafter created under the laws of this State," and the Western Union Telegraph Company is not a company created under the laws of Illinois, but is a New York corporation, allowed by comity to do business in this State. The decision in the case involving the constitutionality of the Railroad law of 1850, known as the "Grab law," declares that as much of the said law as gives to the municipalities having a registered railroad debt, the State or increased valuation over 1868, and the State tax on railroads added, is in conflict with the constitution of 1870, and the subsequent legislation under it. This decision in no way affects the validity of the bonds, nor their rights to registration, nor levy and collection by State authority of the tax to pay interest on them.

SPIRITUAL PHENOMENA.

[From the Liverpool Post.]

At a private party, given at his London house during the past week, Sir Charles Wheatstone exhibited some curious electrical experiments for the amusement of his friends, which would seem to throw some light on certain so-called "spiritualistic manifestations." In a dark room, by a stamp of his foot, Sir Charles produced a brilliant crown of electric light in mid-air, while musical instruments seemed to be played by invisible hands, whereas the sounds really came from an adjoining room, in which the player sat, and were made to appear to be produced by the instruments before the spectators by an ingenious contrivance. A contest between science and the "spirits" in their own chosen feats would be almost as memorable as the celebrated competition between Moses and the magicians.

SHOCKING.

An Ames, Indiana, citizen, who ought to have known better, recently got himself into trouble with the Western Union Telegraph Company. For some time past the Company has had trouble with their main California lines, a singular and unaccountable obstruction occurring and recurring at irregular intervals, which baffled, for weeks, the efforts of the repairers to trace to its origin. The great mystery was cleared up, however, week before last, when it was discovered that the line, as it ran by the house of a prominent merchant, passing, in its way, very near to the top of the porch, was being tapped by the merchant, who used the Company's electricity for the purpose of giving shocks to his visitors. Such shocking conduct as this called down the wrath of the Company upon him, and they are suing him, in the Iowa courts, for the recovery of \$100 damages for trouble and expense caused by his action.

FOREIGN ITEMS.

CONFERENCE OF TELEGRAPH COMPANIES.

The principal submarine telegraph companies are now holding a conference at the offices of the Eastern Telegraph Company, at London, for the purpose of examining and revising the regulations which were sanctioned by the telegraph convention of Rome, with a view of submitting at the next International Conference, to be held at St. Petersburg next year, such alterations as may in their opinion tend to the most effective working of the international telegraph system, and more especially as regards the regulations concerning telegrams exchanged with countries out of Europe. Major Bateman Champain, R.E., represents the Indo-European Telegraph Department; Sir James Anderson, with whom are Mr. Wells and Mr. Ansell, the Eastern Telegraph Company; Mr. Weaver, the Anglo-American Telegraph Company; Mr. Andrews, the Indo-European Telegraph Company; Colonel Glover, Indian Submarine Telegraphs; Mr. Erichsen, the Great Northern Telegraph Company; Major Wood, the Western and Brazilian Telegraph Company; Mons. Chauvin, the Direct United States Telegraph Company; and Mr. Malcolm J. Brown attends on behalf of the English Telegraph service.

GREAT NORTHERN TELEGRAPH.—The traffic receipts for the month of June amounted to 391,918fr., and for June, 1873, to 265,753fr. The aggregate receipts for the six months ending June amounted to 2,089,408fr. (£83,576), and for the corresponding period in 1873 to 1,450,239fr. (£58,009).

FRENCH ATLANTIC TELEGRAPH.—At the liquidation meeting of the shareholders, the balance of assets remaining, after distributing 4s. a share to the members, and the satisfying by the liquidators of all outstanding liabilities, was voted as remuneration to the liquidators. As far, therefore, as the shareholders are concerned, the liquidation of the old French Cable Company is virtually completed.

GLOBE TELEGRAPH AND TRUST.—The directors have notified that at the meeting on the 31st of July a final dividend of 8s. per share on the preference shares, making, with previous quarterly payments, 6 per cent. for the year ending the 18th of July, 1874, and 8s. per share on the ordinary shares, making, with previous distributions, 5½ per cent. for the year, will be recommended.

CUBA SUBMARINE TELEGRAPH.—An extraordinary general meeting of this company has been held to confirm the resolutions passed at a late meeting for increasing the capital of the company by the issue of 6,000 new shares of £10 each, bearing a preferential dividend of 10 per cent. per annum. The resolution of confirmation, having been seconded, was agreed to, and the proceedings terminated.

SUBMARINE TELEGRAPH.—The receipts for the month of June, 1874, amounted to £8,647. The receipts for the corresponding month of the preceding year amounted to £7,718, being an increase of £829.

A DEPUTATION from the Anglo-American Telegraph Company, consisting of Lord Monck, Captain A. T. Hamilton, Sir D. Gooch, M.P., Mr. Cyrus W. Field, Mr. F. A. Bevan, Mr. W. Barber, Mr. C. Burt, Mr. H. Weaver, and Lord William Hay, has had an interview with the Earl of Carnarvon at the Colonial office in reference to the company's claims to exclusive rights to lay cables between Ireland and Newfoundland.

A TELEGRAM, under date Bombay, June 29, states that Schwendler's system of duplex telegraphy over a single line is working satisfactorily between Bombay and Calcutta.

THE Brazilian Submarine Telegraph Company have issued a circular congratulating the shareholders on the successful completion of the line between Portugal and Brazil, and explaining the arrangements which we mentioned a fortnight ago.

THE directors of Hooper's Telegraph Works have received the following telegram from their engineer-in-chief:—"26th noon; arrived at position T; insulation perfect; all well on board. France sixty-three miles off Cayenne."

THE total number of messages from postal telegraph stations in the United Kingdom during the week ended the 27th of June, 1874, and during the corresponding week of 1873, was respectively:—Week ended June 27, 1874, 391,187; week ended June 28, 1873, 343,338—increase in the week of 1874 on that of 1873, 47,849.

THE directory of the Transandine Telegraph Company have been informed by the manager of the River Plate Telegraph Company that he expects telegraphic communication to be established with Rio, Pernambuco and Para by the end of August.

THE manager of the West India and Panama Telegraph Company's cables is now in Cayenne, superintending the laying of a submarine cable from Para to Demerara, which will connect Jamaica in six weeks with Para, Pernambuco, Bahia, Rio de Janeiro, Montevideo, Buenos Ayres, Valparaiso, Chili and Bolivia.

TELEGRAPHIC communications between San Salvador and Guatemala, C. A., has been established.

It is proposed to lay a telegraphic cable from Port Limon, Costa Rica, to Aspinwall, with land lines to connect with Nicaragua, San Salvador and Guatemala.

ELECTRICITY IN COMMERCE.

Not many years ago, even at the lectures of the Royal Institution, electricity was treated as a child's toy. People laughed at seeing each other undergo the electric shock, and all the young people were highly amused when they saw the hair, "like quills upon the fretful porcupine," stand on end upon a wig block; and even the lecturers did not attempt to carry the matter further than to show that the subtle agent which they were able to obtain by friction from a piece of amber was identical in some respects with the awful and terrible thunderbolt. Now, however, the state of things is quite different. First came the electrotype process, which cheapened the manufacture of all plated ware. Next came the telegraph, and now we can waft a sigh from Indus to the Pole. It is needless to dwell here upon the immense durable advantages which civilization and commerce have derived from the use of the electric fluid as the world's messenger; and one evening last week we had the satisfaction of witnessing a series of experiments which demonstrated to all who were present—some of them the most eminent electricians of the age—that the efforts which have been for years past made to turn the fluid to account as an illuminating agent, have at last culminated in success. It is not here necessary to particularize the several methods which have been hitherto tried to subdivide the current. It is sufficient to mention that, as each defect was detected, ingenuity, directed by perseverance, was brought to

grapple with it, until experimentalists have, at length, brought the arrangements to a state of perfection. It is extremely difficult, in a notice of this kind, to explain the character of the exposition we witnessed the other evening. It will be sufficient to say that the carbon points were ignited in vacuum, which is Kosloff's system, and that the current obtained from Gramme's magneto-electric, which is the property of the Electric Power Company, was distributed among nine lamps, and passed about from one to another with as much ease as ordinary gas can be distributed. With the Gramme machine—the very same which has been employed in sending the current to the top of the Clock Tower at the Houses of Parliament—running at about 200 revolutions per minute, a moderate light was obtained, which was greatly improved at 300 revolutions, the maximum of intensity being obtained at 450 revolutions. The strength of the light depends upon three things—the power of the machine and the number of its revolutions, on the length and thickness of the carbon rods, and on the quality of the carbon. The experiments showed that with the same strength of current and the same number of revolutions double the amount of light was obtained with the three long carbon rods as compared with the six short ones. The experiments demonstrated satisfactorily the fact that the electric current could be subdivided, and hence, if practice confirms experiment—which it is believed it will—there is a wide field open for the application of Kosloff's system. And it should be here remarked that the form of lamp used by the inventor is also experimental, and its variation does not affect the principle. He leaves it to mechanical science to devise a lamp which shall meet the varied requirements of light-houses, mines, submarine works, railways, and other purposes, to which, it was the general opinion on Tuesday, the principle is thoroughly applicable.

Such is the opinion of such men as Sir C. Wheatstone, R. Sabine, C. E., F. Braby, H. Kember, Col. Wortley, Capt. Davis, J. L. Muter, H. Holmes, M. Weosterman, E. H. Walenn, W. Abbott, and of several others who feel an interest in the extension of the use of electricity to other purposes. As an illuminant its reputation is completely established. Mr. Douglas, the engineer of the Trinity House, has reported most favorably of it, giving it the preference of every other light tried in the Clock Tower of the Houses of Parliament, on account of its safety, its cheapness, and its immense illuminating power, which he found to be three times greater than that of gas supplied with 300 cubic feet per hour. He adds that the light has been in use for the last two and a half years at Souter Point Lighthouse, on the Durham coast, and that it has never been known to fail for one moment.

We are convinced that we shall soon see the use of the fluid further extended. Metals can be dressed free from deterioration in the flame created by the fluid, which can also be turned to account as a means of heating our boilers—nay, may do away with the necessity for them, by superseding steam as our motive power.—*The Railway News.*

M. ALVERGNANT has devised an ingenious apparatus which shows that an electric current will not pass equally well in two directions. Two glass tubes are connected together at the ends by arched pieces, and in one the points of a number of small glass pipes are turned in the opposite direction from those in the other tube. The current instantly passes through the tube in which the points are apex toward the negative poles. The tubes are filled with hydrogen, showing the oscillation of the luminous zones with great clearness.

TARIFF BUREAU.

SEMI-MONTHLY CIRCULAR.

EXECUTIVE OFFICE,
WESTERN UNION TELEGRAPH COMPANY,
145 BROADWAY, NEW YORK.
August 1, 1874.

To all Offices on W. U. Lines:

The following changes and additions have been made since the date of the last circular:

GENERAL INFORMATION.

Foreman Station, Ill., closed.
Opdyke, Ill., re-opened.
De Soto, Ka., re-opened, square 447.
Raymond, Ka., re-opened, square 531.
Williamstown, Ky., closed.
Madison, Me., new office opened in last JOURNAL, should read Madison Bridge.
Chestertown, Md., is now a W. U. office, square 67, check direct.
Kingston, Md., closed.
Massey's Cross Roads, Md., is now a W. U. office, square 67, check direct.
Oscoda, Mich., closed, send and check business to An Sable.
Messages taken for Holmes' Hole, Oak Bluffs, Vineyard Haven, and Martha's Vineyard, Mass., should be sent to Woods' Hole, Mass., from which point they are delivered via steamers leaving three times a day.
The P. O. A. of 58 Abington, Luzerne Co., Pa., is "Humphreysville, P. O." instead of Waverly, as printed in tariff book.
Espyville, Crawford Co., Pa., re-opened.
Trunkerville, Pa., re-opened.
The P. O. A. of Montreal Junction, Que., is Montreal, Que.
Klingston Hill, R. I., closed.
Lovelsdy, Tex., closed.
Half rate messages may be taken for, and received from the following offices in Texas, on the Texas and Pacific R. R. line:
Atlanta. Honey Grove.
Bonham. Hawkins.
Brookston. Lanark.
Clarksville, Red River Co. Moore's Landing.
Elmo. Paris.
Fornacy. Savoy.
Gladewater. Terrils.
Grand Saline. Wellspring.
Alburt Springs, Vt., changed to East Alburt. Messages for Alburt and Alburt Springs, Vt., are delivered from East Alburt. Charges for delivery \$1.00 and 25 cents respectively.
The P. O. A. of Congress Hall, Sheldon, Vt., is Sheldon Station, Sheldon, Vt.
Otsago, Wis., changed to Doylestown.

SUMMER OFFICES RE-OPENED.

41 Norwood, N. J.
46 Cozzens' Hotel, West Point, N. Y., check West Point.
37 Lake Mahopac, N. Y.
Capon Springs, Va., 25 cents more than Winchester.

NEW OFFICES.

San Luis Obispo, Cal.
Ukiah, Cal.
307 Dundee, Ill.
308 Strawn, "
* Howard Lake, Minn., 125 8 307 Chicago, Ill.
* Langdon, " 100 7 307 "
448 Sarcosie, Mo.
41 Tenafly, N. J., summer office.
* Beavertown, Ulster Co., 25 2 40 Rondout.
139 Fair Point, N. Y.
40 Sharon Station, N. Y.
140 Manorville, Pa.
143 Allegheny Depot, Va.
* Atwater, Wis., 50 8 307 Chicago, Ill.
* Centralia, " 75 5 307 "
* Devil's Lake, Wis., 60 4 307 "
* Doylestown, Wis., formerly Otsago, 50 8 307 "
* Hubbellton, Wis., 40 3 307 "
* Menasha, " 60 4 307 "
* Millston, " 75 5 307 "
* Reedville, " 50 8 307 "
* Richland Centre, Wis., 85 6 307 "
* Rusk, " 100 7 307 "
* Sextonville, " 85 6 307 "
* Shiocton, " 75 5 307 "
* Westport, " 60 4 307 "
The tariff to square 48 is same as to square 49.

TO OFFICES HAVING "SHEET C."

Add the following offices in Iowa and Wisconsin to your sheet C., and check them accordingly.

31 Beulah, Iowa.	17 Hubbellton, Wis.
17 Atwater, Wis.	25 Millston, "
25 Centralia, "	15 Menasha, "
24 Devil's Lake, Wis.	7 Reedville, "
17 Doylestown, Wis. formerly Otsago.	83 Rusk, "
	17 Westport, "

WILLIAM ORTON, President.

TRANSFER SERVICE.

EXECUTIVE OFFICE,
NEW YORK, July 27, 1874.

On and after August 10th, St. Charles, Mo., will be discontinued as a money transfer office.

GEO. H. MUMFORD,
Vice-President.

EXECUTIVE OFFICE,
NEW YORK, July 28, 1874.

From and after August 1st, all Money Order Offices in the district heretofore in charge of G. E. Netherland will be transferred to L. C. Baker's district.

GEO. H. MUMFORD,
Vice-President.

THE TELEGRAPHERS' MUTUAL BENEFIT ASSOCIATION.

ACKNOWLEDGMENT OF RECEIPTS FOR ASSESSMENTS
NOS. 63, 64 AND 65, UP TO AND INCLUDING JULY 25TH, 1874.

5, 13, 25, 26, 28, 46, 54, 59, 60, 61, 67, 72, 75, 82, 89, 101, 108, 108, 112, 114, 129, 134, 136, 139, 140, 146, 148, 223, 235, 240, 244, 247, 257, 267, 278, 279, 281, 282, 283, 285, 312, 319, 323, 328, 350, 351, 367, 371, 376, 378, 380, 381, 391, 392, 393, 402, 405, 406, 413, 425, 441, 456, 468, 516, 520, 533, 548, 553, 554, 565, 575, 577, 579, 584, 604, 622, 648, 656, 672, 678, 690, 695, 699, 701, 708, 739, 734, 735, 741, 769, 787, 791, 801, 803, 809, 830, 843, 853, 856, 915, 927, 930, 931, 939, 943, 976, 978, 980, 995, 998, 1000, 1002, 1005, 1013, 1047, 1055, 1058, 1061, 1080, 1085, 1093, 1099, 1102, 1148, 1149, 1152, 1154, 1191, 1193, 1194, 1196, 1236, 1237, 1233, 1241, 1246, 1251, 1255, 1266, 1276, 1307, 1308, 1309, 1311, 1312, 1313, 1314, 1315, 1317, 1318, 1319, 1320, 1331, 1332, 1335, 1339, 1340, 1342, 1344, 1346, 1348, 1349, 1350, 1351, 1352, 1359, 1366, 1368, 1372, 1386, 1389, 1390, 1391, 1407, 1412, 1415, 1427, 1437, 1438, 1448, 1451, 1454, 1455, 1456, 1457, 1458, 1481, 1482, 1500, 1501, 1503, 1508, 1509, 1507, 1513, 1515, 1522, 1524, 1550, 1554, 1555, 1560, 1564, 1568, 1569, 1570, 1572, 1573, 1580, 1586, 1588, 1591, 1593, 1594, 1615, 1620, 1625, 1634, 1635, 1656, 1666, 1676, 1681, 1686, 1708, 1723, 1729, 1736, 1737, 1773, 1775, 1785, 1794, 1795, 1796, 1797, 1804, 1809, 1817, 1823, 1824, 1827, 1833, 1839, 1874, 1881, 1911, 1913, 1914, 1915, 1916, 1942, 1943, 1951, 1957, 1969, 1970, 1999, 2000, 2001, 2021, 2025, 2028, 2029, 2038, 2050, 2057, 2060, 2065, 2068, 2069, 2097, 2108, 2113, 2114, 2119, 2123, 2125, 2134, 2137, 2138, 2142, 2143, 2145, 2147, 2154, 2162, 2169, 2172, 2173, 2187, 2191, 2192, 2195, 2196, 2212, 2213, 2216, 2218, 2219, 2221, 2223, 2224, 2228, 2236, 2237, 2238, 2239, 2243, 2250, 2252, 2253.

ASSESSMENTS NOS. 63 AND 64.

255, 344, 361, 1205, 1742, 2040, 2181.

ASSESSMENT NO. 62.

27, 143, 228, 242, 246, 258, 331, 336, 451, 453, 455, 457, 730, 804, 1153, 1450, 1502, 1563, 1715, 1716, 1731, 1736, 1933, 1939, 1941, 1974, 1975, 1976, 2037, 2163, 2177.

Members of the Association who look to the JOURNAL OF THE TELEGRAPH for receipt of assessments paid, will please take notice, that an acknowledgement of the receipt of one assessment should be taken as a receipt for all previous assessments.

BORN.

CROCKETT.—At Rockfield, Ind., July 15, 1874, to R. W. Crockett, agent and operator, T. W. and W. Ry., a son.

FRIES.—At Friendship, N. Y., July 3, 1874, to George W. Fries, Manager W. U. Tel. office, a daughter.

DIED.

BOK.—At Brooklyn, N. Y., July 21, 1874, John William, youngest son of William J. H. Bok, Translator of Languages to the W. U. Tel. Co., 145 Broadway, N. Y., aged 16 months.

GOOD WORK.

Abbott's Circular for July has the following in relation to the Anglo-American Company:

"The revenue of the Anglo-American Company continues to augment on a large scale, and it is extremely satisfactory to learn that the average time occupied in the transit of all messages between London and New York, during the month of May, did not exceed 17 minutes and 50 seconds. This rapid working becomes startling by contrast with that nearer home; thus a message from London to Paris occupies about one hour, and it is quite a matter of congratulation if, during the hours of business, the reply to a message to Paris can be received in London in less than two hours and a half; in fact, so perfect has become the organization of the Anglo-American Company that messages can be forwarded from London to California and a reply received thereto in the same space of time as is at present occupied for a similar service between London and Paris. In the former case 11,000 miles have been traversed, whereas in the latter the distance to and fro does not exceed 500 miles."

THE DUPLEX SYSTEM ON LONG SUBMARINE CABLES.

The *Telegraphic Journal* of London, in its issue for June 15th, publishes a communication from Mr. C. V. De Santy, under date of Gibraltar, May 25, as follows:

"It must prove interesting to your readers to learn that the possibility of working the duplex system of telegraphy on long submarine cables is no longer a matter of doubt.

"After fourteen months of experiments I have at length succeeded in obtaining very satisfactory results on the Gibraltar and Malta cable (1,121 nautical miles), and do not doubt but that on receiving some additional instruments I shall be able to practically establish permanent correspondence between Gibraltar and Malta on this system."

THE GREAT WESTERN TELEGRAPH COMPANY.

The Great Western Telegraph Company met with another financial storm yesterday, which, however, it managed to weather for the present. Mr. Hilton having succeeded in getting three judgments against the company in the Cook county Superior Court, to the amount of \$21,000, put in an appearance yesterday morning with an execution for \$8,000 in the hands of a sheriff. When the execution was served there was great excitement in the Great Western camp. The employees turned pale thinking that they were undoubtedly thrown out of work. But their apprehensions were soon allayed. It seems that the judgments were obtained during the proprietorship of Gage and Reeve in the company, and were used by Hilton as a cunning dodge to put the company into bankruptcy. Later in the day the officers of the Great Western gave bonds for their appearance in court and were allowed to resume business. The claims of Hilton will be contested in the State courts. Meanwhile there is no interruption in the business of the company.—*Chicago Times*, July 14.

SOUTHERN AND ATLANTIC TELEGRAPH COMPANY.

A meeting of the stockholders of the Southern and Atlantic Telegraph Company was held in this city on the 22d ult. Mr. Henry Hentz was elected President in place of Mr. J. R. Crenshaw, resigned; and Mr. C. W. Blossom, Vice-President, to fill an original vacancy.

AN IMPORTANT DECISION REGARDING THE CONSTRUCTION OF TELEGRAPH LINES ON RAILROAD PROPERTY.

The following is the text of the decision of Judge Drummond, of the United States Circuit Court for Illinois, refusing to sustain the Atlantic and Pacific Telegraph Company in its effort to build telegraph lines along the railroads without paying for the right of way :

THE ATLANTIC AND PACIFIC TELEGRAPH COMPANY

vs.

THE CHICAGO, ROCK ISLAND AND PACIFIC RAILROAD COMPANY.

Decision by DRUMMOND, J.

This is a bill filed by the plaintiff, setting forth that the defendant will not permit the entrance of plaintiff upon its right of way, for the purpose of establishing thereon a telegraph line, and asking that an injunction may issue to prevent the defendant from interfering with the construction of such line. The only controversy here is, as to so much of the defendant's railroad as lies in this State.

The plaintiff claims it is a corporation organized under the laws of New York for the purpose of constructing a telegraph line between the City of New York and San Francisco ; that, in order to carry out that purpose, it is necessary to construct such line upon the right of way of defendant, between Chicago and Omaha, and so upon that part of defendant's road lying within this State.

The authority to do this is claimed to exist under various Acts of Congress, some of which declare all railroads in the United States to be post roads (routes).

By these Acts I understand nothing more than that the mails can be transported over railroads as over ordinary public highways, with all those securities and safeguards thrown around the transit of the mails by various Congressional enactments.

It does not necessarily follow, that because railroads are thus declared post routes, the United States can, therefore, without the consent of the railroad companies, and without compensation, transport the mails over such roads.

An Act of Congress of July 24th, 1866, provides that any telegraph company then organized, or which might thereafter be organized, under the laws of any State in the United States, should have the right to construct, maintain and operate lines of telegraph through and over any portion of the public domain of the United States, and over and along any of the military or post roads of the United States which had been, or might thereafter be, declared such by Acts of Congress.

There can be no doubt of the plenary authority of Congress over the public lands or military roads of the United States. It is also competent for Congress, as it has frequently done, to make grants of public lands to railroads upon such conditions as it may choose to annex thereto.

The main controversy in this case turns upon the true construction of this Act of Congress.

The bill avers that the defendant has a right of way over which its railroad is constructed. There is nothing to show that this right of way was granted through the public lands by Acts of Congress. On the contrary, the fair inference is that the defendant acquired it either by direct purchase from the owners of the land, or by condemnation of the land for the uses of the railroad in accordance with the laws of the State. In either case the railroad would own the

property for its own special purposes, having paid for it either by express contract with the owners thereof, or in accordance with the method provided by law.

It is true that a railroad has certain public uses, and is, for certain purposes, subject to the control of the State ; and for these public uses the law authorizes the condemnation of private property ; but still, when the property has thus been acquired, or by purchase, it becomes private property, notwithstanding the railroad has public uses. That is to say, the property can be used for the benefit of the shareholders of the Company.

The right of way can be so used, just as much as the road-bed itself, the ties, the rails, the locomotives or the cars ; they are all to be used for the benefit of the shareholders, although such uses may be of a public character, and the public may have a certain limited control over them.

The right to construct a telegraph line implies the possession, control and use of real property, and, in this case, of the possession, control and use of a portion of the right of way of the defendant.

The question here is, whether Congress intended that, in such a case as is now before the Court, any telegraph company could, without compensation to the railroad company, exercise these rights of possession and ownership.

I think that such cannot be considered the true construction of this Act of Congress of 1866.

The Act provided that telegraph companies might have the right to take and use, from the public lands of the United State, some, timber and other materials, for its posts, piers and stations, in the construction, maintenance and operation of lines of telegraph.

There could be no objection to such a grant, as to the public lands of the United States, but there seems to be insuperable objections to such a construction of the Act as would authorize the taking and using by telegraph lines of lands owned by railroad companies, and of which they seem to have the exclusive control, for their own purposes.

Such a construction will not be placed upon the Act, unless its language is inconsistent with any other meaning. And I do not think the true construction of it is that it intended to authorize any telegraph company to work on the roadway of a railroad, or upon a post road of a railroad belonging to it, and not to the public.

The rights of a railroad over its roadway are different from those which belong to the public at large, in regard to the ordinary highways and roads of the country. Over the latter any person can travel ; there is an absolute right of user in the public.

In the case of public turnpikes and bridges this right sometimes exists, subject to the claim of the proprietors of such turnpikes and bridges to exact a certain compensation for the privilege of passing over them, but the right to pass is absolute, subject to the payment of the requisite toll. Such rights do not exist, on the part of the public, as to railroads or the right of way of railroads.

It could not be claimed that after a railroad company had purchased its land, laid down its ties and iron, and placed upon the road its locomotives and cars, an Act of the Legislature of a State or an Act of Congress could authorize any other railroad company to pass its cars or locomotives over such railroad, without compensation and without permission, unless, indeed, such right was reserved in the charter, or the grant was made subject to the same. The railroad itself alone has the right to pass its own

cars and engines over its roadway, and to use it all for the profit of its shareholders.

The right to construct a telegraph line would imply the right to construct another railroad, or to add indefinitely to the number of telegraph lines that might be placed over the right of way.

The right of the telegraph company to construct its line over the right of way of the defendant is a right inconsistent in many respects with that absolute right which the defendant possesses over its own road-bed and right of way.

For example, the railroad has a right to take gravel and dirt throughout the whole extent of its right of way, or to use that right of way for the purpose of laying down additional tracks or side tracks.

But the right to construct a telegraph line thereon necessarily interferes with the absolute right of the railroad to its right of way. That is a right which cannot be taken without compensation. It is a right of property existing in the railroad company, which no person or other company can take from it without its consent or without paying for it.

In view of these considerations, it is, I think, clear that this Act of Congress did not intend to confer on the plaintiff any such right as is contended for. That such was the intention would not be inferred. And granting that such was the intention, it is beyond the authority of Congress to deprive the defendant of its rights of property without providing compensation, because the construction of a telegraph line involves, necessarily, the actual taking of property.

I am of opinion that plaintiff's claim is not maintainable in point of law ; that it has no right to establish a telegraph upon defendant's right of way, without making compensation therefor, in accordance with law.

It is urged that the State statute authorizing the condemnation of private property for the use of a telegraph line only refers to companies existing under the laws of the State, and is not applicable to this Company, a corporation created by the laws of New York.

If this be so, it furnishes no reason why the plaintiff should take the property of any corporation in this State without paying for it. It is one of those cases omitted in the law, but because of that omission the plaintiff is not clothed with any additional rights.

The motion for an injunction is overruled.

TIME TELEGRAPH OF THE READING RAILROAD COMPANY.

The manner of giving the correct standard time of the Philadelphia and Reading Railroad Company to all its telegraph stations, 255 in number, along the main road and all its branches, is as follows : At three minutes to 4 o'clock P. M., daily except Sunday, all business along the lines is suspended ; and by means of a series of repeaters, all the lines of this company, 36 in number, are arranged so as to be operated and controlled by one operator at the Reading office, who has a chronometer before him, from which the correct time is given. Commencing at three minutes to 4 P. M., the Reading operator says "time" on the lines, which calls the attention of all operators to adjust their clocks, and is continued at short intervals until five seconds to 4, when he opens the circuit. At 4 o'clock he makes one tap ; at fifteen seconds after 4, two taps ; at thirty seconds after 4, three taps ; at forty-five seconds after 4, four taps, and at one minute after 4, five taps. By this arrangement every telegraph station is able to get the correct time to the second, daily, and thereby have the railroad clocks and watches of the employés properly adjusted, which is a very important matter in the management of a railroad.

Journal of the Telegraph.

This Journal is issued on the 1st and 15th of each month. Its circulation is over 8,000. It goes to every State, Territory and Province on the Continent. It has become a necessity, and is always welcomed as a friend. No better medium for advertising exists.

TERMS:

TWO DOLLARS PER ANNUM IN ADVANCE.

Address—

JOURNAL OF THE TELEGRAPH,

Western Union Telegraph Company,

145 Broadway, New York.

NEW YORK, AUGUST 1, 1874.

THE Atlantic cable of 1866, which ceased working on April 18th, owing to a fault reported to be about twenty-five miles from the Irish coast, has been repaired. There are three cables now in good working condition, and we learn from London that the new cable for the Anglo-American Company has been completed by the Telegraph Construction and Maintenance Company, and that it is being placed on board the *Great Eastern*. It is expected that the *Great Eastern* will, early in August, proceed to submerge this cable between Ireland and Newfoundland.

THE efficiency of the service of the Western Union Telegraph Company is well illustrated by a statement which we copy from Mr. William Abbott's *Monthly Circular* for July 1. This statement, which alludes to the perfect organization of the Anglo-American Telegraph Company, says that messages are exchanged between London and California in the same space of time occupied for similar service between London and Paris, the distances respectively being about 5,500 and 250 miles. As the Western Union Company perform over two-thirds of the entire service between London and California, the exhibit is a remarkable evidence of the efficiency of that Company, and, considering the respectable source from whence it comes, the appreciation is all the more valuable.

At a meeting of the New York Board of Aldermen on Tuesday, July 21st, a communication was received from the Law Telegraph Company asking the privilege of placing telegraphic instruments in various court-rooms, and connecting them by means of wires with the various law offices of the city. A resolution granting the permission was passed.

THE Lebanon and Nashville Telegraph Company are building a line from Lebanon, Tenn., to Nashville, where it will connect with the Western Union. The line will be completed in August. Thomas Toney is President and Superintendent, and H. C. Brown, Secretary and Treasurer; Lebanon, Tenn.

DID THE SEA SAVE THE NATION?

In an article written by us in November last we used the following language respecting the telegraph:—"It is harnessed to every storm. It outlines every railroad. It feeds and animates the press. It is the right hand of peace, the necessity of war. It touches all things." That was written in the glow of a recent revelation of its power. We are reminded by a remarkable work just published that even the telegraph has its dark side. The work alluded to is the "History of the War of Secession," by the Comte de Paris. It is a vivid picture of that dark epoch. It leads us back, in the broad daylight of these now peaceful years, to look at the gulfs and dangers through which the nation unconsciously passed in the long night of its sorrow. At one critical period it now appears that had the Atlantic Cable existed at the time of the seizure of the Confederate Commissioners on board of the *Trent*, war would have been inevitable. With a foreign and domestic war simultaneously letting slip their devouring dogs, it makes one shiver, even at this distant period, to think what might have been the depths of darkness into which the quivering nation might have been plunged.

After a brilliant summary of the circumstances, the boarding of the *Trent* by the Federal marines, the quick and fiery indignation of England, the stimulus of the hatred of the richer classes to the North, the pugnacity of Palmerston, the sending of the Guards to Canada with their bands playing "I am off for Charleston," the Comte de Paris says:

"There were two men from whom a single imprudent word might have caused, at this critical moment, irreparable evil. These were Lord Lyons, Minister of England at Washington, and Mr. Adams, Minister of America in London. They both showed a tact and a skill for which their fellow-citizens should owe them eternal gratitude. They had as an auxiliary the Atlantic, which, by imposing on the communications between the two countries a delay of 15 days, gave time for salutary reflections to make themselves felt on either side. Mr. Adams afterwards told the author, who was at the time at Washington, that if the transatlantic cable had then existed, war would have been inevitable."

We do not desire to question the truth of Mr. Adams' remark. He was in the vortex of the occasion, and saw the danger with vividness which no other eyes could. Yet, there is this to be said, and we base it on the very statement of the royal historian before us—during all this tempest there lay a dispatch on Palmerston's desk from the American Cabinet, written immediately after the arrival of Wilkes, giving the certain pledge of a friendly arrangement. *This dispatch was carefully concealed.* It was easy to keep it so. But does any one believe that had the cable existed, the spirit of that message could have been hidden? No. A thousand British merchants would have as quickly known that America disowned the act; and we are not sure that had it been so, the troops who were rushed in ignoble haste to Canada, playing "I am off for

Charleston," might have been left to the evening parades of Woolwich and the peaceful notes of "Robin Adair" and "God Save the Queen."

IS IT TRUE?

In England, especially when wanted for a distant service, operators are required to pass a more or less rigid examination respecting their knowledge of circuits, mode of manipulation, and the extent of their general education. In the Netherlands the strictness of this examination is interesting and peculiar. For those who believe in accepting men for so responsible a service with no reputation save the ability to send a given number of words per minute, let us give some of the points of a trans-atlantic examination. The candidate must be:

1. A Netherlander, not younger than 18 nor more than 25.
2. Of irreproachable character, and stating the candidate's fixed dwelling place.
3. Healthy and without bodily defects. Ears and eyes good.
4. Quick, clear, elegant writing.
5. Must present a thesis in Dutch, sound, good style, grammatical.
6. Knowledge of French, English and German languages and rules of each.
7. First principles of arithmetic, doctrine of proportions, common and decimal fractions, metrical system of weights and measures.
8. Rudiments of algebra as far as the quadratic equations.
9. Rudiments of geometry, and principles of geometrical drawing.
10. Geography, situation of states and principal towns.

These are required of applicants for apprenticeship!

When these apprentices desire to become telegraphists of the third class, they require to pass examination on the following:

1. Magnetism. Influence of magnets on each other; magnetism of the earth; difference between statical and dynamical electricity.
2. Inconstant and constant batteries.
3. The law of Ohm.
4. Electro-magnetism; galvanometer; multiplication; magnetizing by galvanic currents; electro-magnets and their different forms; remnant magnetism, &c.
5. Galvanic polarization.
6. Atmospheric electricity.
7. Lightning conductors.
8. Intensity of the current; electromotorial force and resistance of the batteries.
9. Conductibility of metals and fluids.
10. The earth as a conductor.
11. Office connections.
12. Commutators and connections.

These are about one-half of the subjects of examination, which extends to every department of knowledge of the machinery, batteries, modes of working

lines, geographical knowledge and of the general rules governing European telegraph administration. No doubt many an operator who sees this will open his eyes in astonishment. And if it were our happiness to announce that the new rules contemplated a similar searching investigation and amount of learning, wouldn't some new Grays be found writing Elegies in church yards, and Kirk Whites uttering apostrophes on Disappointment!

Now, we do propose that something shall be required of men and women entering the service, beyond a clean collar and two fingers of one hand educated in a rude way to dot and dash making. How much knowledge shall be required we will not predict. He must certainly know his telegraphic letters and make them correctly; he must write a clear hand; he must have a knowledge of circuits and office connections; he must be informed respecting the Company's rules. Yet these simple requisitions are objected to. "I fear," says the manager of a large office, "if this were required here, I would be left almost alone." Another says, "Don't do it; the extent of ignorance is fearful." Another writes, "It is a lamentable fact that very many of our first-class operators in large offices are ignorant on the points named." We ask, can this ignorance of the commonest knowledge of a great business be true? We fear it is.

THE NEW CODE OF RULES.

The heading to this column is becoming somewhat chronic, and no doubt some think it is time to change it. Yet as good rules lay at the very core of the business, it should not be wonderful that the correspondence respecting them has been very prolific, very broad, and, we are glad to say, very intelligent and suggestive. On these suggestions a numerous code has been compiled and presented to the executive. Among the curiosities of the correspondence respecting rules, is the reception from a single writer of nearly two hundred foolscap pages of closely and neatly executed manuscript. Its diffuse style has prevented any use of this vast amount of matter except in the briefest manner, yet it was throughout, eminently intelligent and readable. Very few articles have gone to the basket unnoticed, and these simply because they were duplicates of thoughts already presented, or because they proposed modes of doing telegraphic work on a radically new basis. Among these last were

1.—The plan adopted in Europe of charging every word, and making twenty words the basis of the minimum charge. This plan is attractive on many accounts, and would simplify instructions, but has been so decidedly rejected in American telegraphy that it is left to executive consideration whenever it shall appear desirable to adopt it. The present system allows an ample address, date and signature free, and, so far, that advantage to the public is regarded as more than an equivalent for the limitory rules which it renders necessary. There is nothing which, even under the present system, is more absolutely necessary of enforcement than the obtaining, on every message, of a clear and correct address. Any system which tends to limit this, is to be avoided.

2.—The absolute prepayment of all messages. Under present conditions this is deemed impossible. Its enforcement, unless under a very diminutive

tariff, would cut off a large and remunerative business. A large proportion of messages are those which require answers, or are answers, or are sent for information in the interest of the receivers. Respect must be had to the peculiarities of our commerce, and methods of mutual service in transacting general business. What is wanted, is a system which shall secure to the company payment for all its labor, and yet fairly meet the average conditions under which telegraphic communication is resorted to and desirable. No telegraph company should assume any risk of collection. Even an answer should be taken with the same security required as of the message it answers. But with a perfect guarantee there should be, if possible, that elasticity which shall accommodate the business and the rules regulating it to the reasonable conveniences of those who use the wires.

We have also laid aside the following, although recording all for notice:

3.—Requiring all messages to be written in ink. This seems impracticable and unnecessary, although desirable and to be encouraged.

4.—To charge half-rates on directions of "special delivery" messages. If any part of the business merits full rates it is this.

5.—To send the check after the address. A bad place. Nothing should be allowed to make a message obscure to the recipient.

6.—To authorize retention of messages to a distance when not provided for. We do not hold it safe or wise to hold back any message by an absolute rule of this kind. Everything reasonable should be done to accomplish delivery.

7.—To allow figures. Executive business.

8.—Repeating the words "paid" and "collect." Very bad business.

9.—Notice to President of suits to be given, also to District Superintendents. The rule proposed is an executive order with which the compiler does not deem it his duty to interfere.

10.—Recommendations respecting blanks. This is beyond the sphere of our work.

11.—Abolition of the "Red" system. We have nothing to do with this matter.

12.—The introduction of new signals. Where the telegraph force is so constantly changing its personnel, we regard it unwise to increase the number of signals. Better have none.

13.—Giving credit. We think rules cannot regulate this. They assume that none is given.

14.—Using various colors of paper for classification of messages.

15.—Liberty to credit Reds. This cannot be done. It is an executive order. Reds have favor enough already. When business is offered to be done at half rates it is not much to demand cash therefor.

HINTS TO OPERATORS.

[Continued from our last number.]

ORDERS FROM CHIEF OPERATORS.

13.—"Open No. —." This is best done in the switch formed of two flat brass springs and a plug between them, by inserting a wad of paper, penholder, or other dry non-metallic substance between the springs; in some switches removal of a peg or turning a button, answers the same purpose. In case you have any doubt at all about the way the switch works, remove the line wire from the screw-post at the top of the switch altogether. If you have but

one wire, leave the key open for the time stated, and then close it.

13.—"Ground No. — north, and leave southern end open." This is best done by removing the southern line wire from the screw-post at the top of the switch, and putting the ground wire in its place. If the southern end of the wire is not required to be left open, the order will simply be "Ground No. —," which can be done by putting the ground wire in, or attaching it to, the same screw-post with either of the line wires.

14.—"Cross-connect No. 1 and No. 2." This means to connect No. 1 south to No. 2 north, and No. 2 south to No. 1 north, so that the wires will work through. The simplest way to do this, is to take No. 1 north and put it in the screw-post where No. 2 north is, then put No. 2 north in screw-post where No. 1 north was.

15.—"Straighten Nos. — and —." This means to restore the wires to their usual condition, and may mean, take ground off, close circuit, or anything that may countermand any change that has been ordered. In connecting one wire with another, the sections of each wire not mentioned in the order are to be left open. An order to "put 1 north 2 south" includes leaving 1 open south and 2 open north.

16.—All wires must be put straight every morning at the opening hour, regardless of the previous day's arrangement, unless specially ordered.

LIGHTNING ARRESTERS.

17.—Lightning arresters are generally formed of two plates of metal, separated from each other by a septum of mica, dry blotting paper, or other insulating substance, or by studs of hard rubber, with an open space between. One of these plates is connected to the line where it enters or goes out of the office, and always forms a part of the circuit; the other plate is connected by a wire to the earth. When a current of electricity of high intensity, like that which produces lightning, passes along the wire, it will be likely to jump from the plate connected with the line to that connected with the earth, and thus be dissipated without damaging the apparatus in the office. In order to do this the plates must approach each other as close as possible, yet not touch, and the connection to the earth must be perfect and of thick copper wire, unless a water-pipe can be reached near the arrester. During a storm, when lightning passes across the space between the plates of an arrester, a slight, snapping sound will be heard, caused by the passage of the spark, and on examining the arrester a hole will be found burned through the insulating septum; or, if the arrester be of the kind in which a vacant space and studs of rubber separate the plates, a black spot and a small cone of black metal will be found on one of the plates. In the former case renew the septum by putting in a fresh layer of tissue paper; in the latter case carefully scrape away the small cone of metal. The plates of arresters must be separated and carefully examined after every storm, as the passage of a spark nearly always establishes a permanent metallic connection between the two plates, thus grounding the line. In damp weather, arresters should be cleansed from dust daily, and if paper or mica be used as an insulator, a fresh, dry layer should be put in daily (in damp weather).

Two elements of real success in any undertaking are a comprehensive view of its nature and intent, and a faithful attention to its practical details. Thought and action are inseparable and equally indispensable. If we would thoroughly perform our task, we must grasp it mentally and do it patiently.]

NEW THERMO-ELECTRIC PILE—M. Clamond.—The author has been improving his apparatus. He found in it a considerable increase of resistance, and this was due to two causes—(1) Oxidation of the contacts of the polar plates with the crystalized bar under the influence of heat; and (2) splitting of the bar and separation of its different parts in planes perpendicular to its length. In making his couple he uses an alloy of zinc and antimony, and plates of iron as armatures. The bars are collected in crowns of ten bars each, superposed and separated by washers of amianthus, and coupled for tension. The whole forms a cylinder, the interior of which is luted with amianthus, and heated by means of a pipe of refractory earth pierced with holes. The gas mixed with air burns in the annular space between the tube and the bars. The entire surface of the crowns of the pile is 35 square decimetres. The consumption of gas is controlled by M. Girond's regulator. Thus arranged, the pile will work whole months without requiring attention, giving a current absolutely constant. The model shown consumed 170 litres, that is, about 5 centimes of gas in the hour, and deposited 20 grms. of copper, which makes the expense of gas per kilogram. of copper deposited 2 francs 50 cents.

TO ELECTRICIANS AND INVENTORS.

OFFICE OF THE UNION ELECTRO-MOTOR CO.,
62 BROADWAY, NEW YORK, July 8, 1874.

The attention of Electricians and Inventors is invited to the following proposition: The

UNION ELECTRO-MOTOR COMPANY

desire to procure a

GALVANIC BATTERY

fulfilling the following requirements:

1. It must be capable of maintaining a steady current of 6 farads per second through a resistance, external to the battery, of two-tenths of an ohm, with not more than six pairs of plate. This is, approximately, equal to the current developed by 30 Chester's No. 2 carbon cells, charged with mixed nitric and sulphuric acid in the porous cells through 50 feet of No. 18 copper wire, .049 inches in diameter.
 2. It must be absolutely free from fumes, and from liability to leak or spill its contents under any ordinary circumstances. If possible, it is desirable that a battery should be provided to work without liquids—in other words, a dry battery.
 3. It must be capable of standing for a considerable length of time unused without material depreciation, and yet be ready to give out its full power at a moment's notice whenever required.
 4. It must be self-supplying to an extent which will render it capable of furnishing a current, as above stated, for not less than 300 hours in succession without renewal.
 5. Other things being equal, preference will be given to the battery occupying the smallest space.
- For the best battery fulfilling the requirements herein specified a premium of

FIVE HUNDRED DOLLARS

will be paid, in accordance with the decision of the judges, if the battery is adopted by the company—which shall also have the privilege of exclusive ownership by paying the additional sum of

FIFTEEN HUNDRED DOLLARS.

This offer will remain open until November 1, 1874.

Judges.—MARSHALL LEFFERTS, President of the Gold and Stock Telegraph Company; GEORGE B. PRESCOTT, Electrician of the Western Union Telegraph Company, and FRANK L. POPE, Electrician.

E. B. GRANT, President.

H. H. DUNCKLEE, Secretary.

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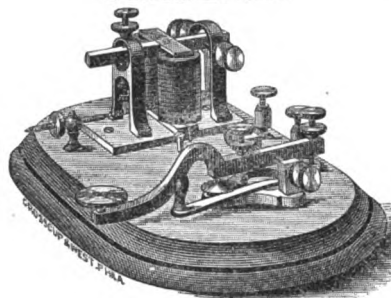
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FOR ANTWERP.

From Philadelphia.	From New York.
VADERLAND, Aug. 6.	SWITZERLAND, Aug. 12.
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For Philadelphia.	For New York.
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These Steamers are supplied with Life-Rafts in addition to the usual Life-Boats and Life-Preservers.

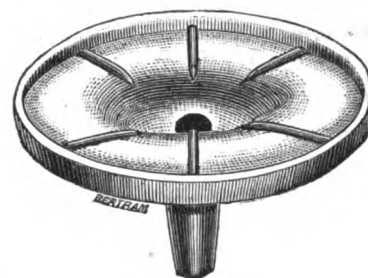
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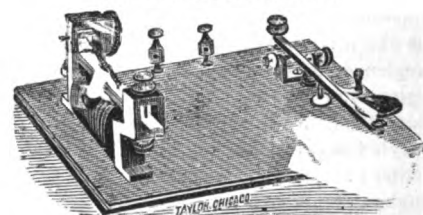
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JOURNAL OF THE TELEGRAPH.

VOL. VII. NO. 16.

NEW YORK, AUGUST 15, 1874.

WHOLE NO. 163.

MEYER'S AUTOGRAPHIC APPARATUS.

Abbé Caselli was the first to solve the problem of autographic telegraphy—that is to say, to reproduce at a distance the exact fac-simile of the message itself. His electro-chemical apparatus, used in France during several years for the regular autographical service, was on exhibition at the Universal Exposition at Paris, in 1867.

About this time Mr. Meyer conceived the same idea—without having recourse to chemical decomposition—to reproduce the fac-simile on ordinary paper and with ink. His apparatus, which from 1868 was substituted in France for the Caselli system, is much more simple than the latter.

In 1873, Mr. Meyer's autographic apparatus was on exhibition in the French Department at the Vienna Exposition. The autographic system of telegraph is peculiarly adapted for countries whose language is wholly, or in part, composed of arbitrary signs or characters, and, as lines of telegraph will probably soon be established in China, a description of the apparatus likely to be employed in operating them will prove to be very interesting.

Figure 1 is a view of the apparatus complete in all its parts. The mechanism for securing synchronous action and the transmitting and receiving portions of the instrument are all actuated by the same power and are upon the same table.

Upon a wooden or iron table is placed a clockwork movement. Upon one side a cylinder, *A*, and pointer, *c*, are employed for the purpose of transmission, and upon the other side a helix, *B*, and an endless band of paper, are used in receiving.

The apparatus is put in motion through a heavy weight and regulated by means of the conical pendulum *K*, having an oscillating stem, whose functions are to form between the two instruments, working together, a regular and synchronical movement. Hence, the description of three parts is necessary, viz: the transmitting, the receiving, and the synchronical system.

TRANSMISSION.

The message is written with an insulating ink on a slip of metallic paper in the inside of a square made with ink. This square is 4 inches wide; it may have any length. The smallest surfaces which are given to the public have $4\frac{3}{4}$ square inches. The metallic paper is tin or silver paper such as the trade uses. Upon this metallic surface can be written at pleasure any language, stenography, plan, drawing, music, etc.

The message which is to be sent, thus prepared, is

rolled around cylinder *A*, which has a diameter of four inches. To make it more convenient, each of the instruments is provided with two cylinders; while one of the messages is being sent another is prepared. This cylinder is engaged and disengaged at pleasure; it turns at a speed of 75 revolutions in a minute. On a stem parallel to the axis of the cylinder, a stylus is located, which is provided with a platina point *c*.

Figure 2 shows the transmitting portion of the apparatus. *I* is a screw whose point runs through

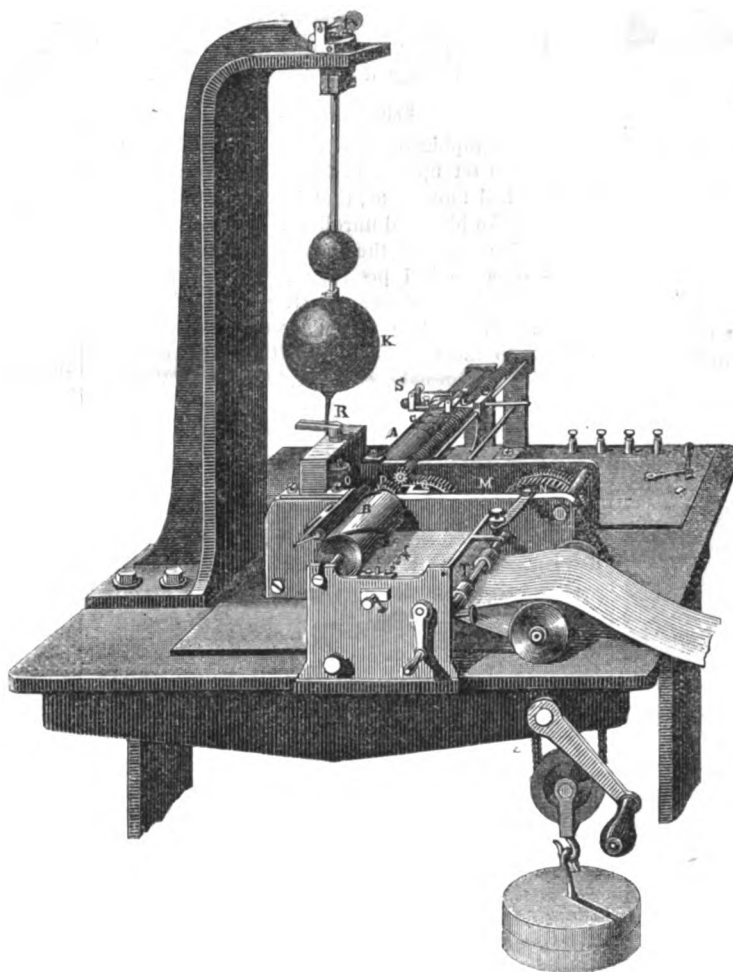


Figure 1.

the endless furrow *H*, which in its revolution moves the pointer from right to left. When the cylinder *A* has made a revolution, the pointer has advanced $\frac{1}{10}$ of an inch, and style *c* has made a full revolution. As the cylinder keeps on revolving, the style executes on its circumference an indefinite helicoidal line whose helices are $\frac{1}{10}$ part of an inch distant from each other. Now, as the message to be sent occupies the surface of the cylinder, all the points of the message will have been successively in contact with style *c*. In its course the style alternately touches an

inked part and a metallic surface in an irregular order, according to the contents of the message. When the style passes on the metal, the current passes; on an inked part it is interrupted. It is this succession of emission and interruptions done by style *c* which constitutes the autographic transmission. The battery current is divided in the sending apparatus into two circuits; one through the line-wire and the other to earth through the metallic sheet. There is a wire from latch *o*, which connects the battery directly to the line, and another going to the style of the pointer; this second circuit becomes completed by the metallic surface of the message, the pencil *D*, which touches there and is connected with the earth.

It follows from this arrangement, that the line battery is always in action. The position of the style *c* determines the distribution of the current through either circuit. When it rests on metal, the local circuit is closed, the entire current of the battery goes to earth through the style, the metallic surface, and the pencil. When the style passes over the inked part of the paper the local circuit is interrupted and the entire charge of the battery goes on the line. Consequently, there is emission of current on the line each time the style passes over the writing, and non-emission, or discharge to earth, from the sending post each time that it touches the metal. Each current, of course, lasts just as long as the style passes over the ink.

We will now see how these successive currents at the receiving of the message reproduce in its exact form the tracing made on the original sheet of paper.

RECEIVING.

The cylinder *B* (Figure 3), carrying on its surface a helicoidal metallic nerve, four inches long, and embracing the entire circumference, is the principal part of the receiving portion of the apparatus. On the top a roller, *J*, soaked with oleic ink, keeps the surface of the projecting thread of the helix inked, turning with it.

Underneath the cylinder is a lever, *G*, in the form of a sash, oscillating in its points, between two regulating screws. The edge of this sash, in its oscillations, comes in contact with the inked thread of the cylinder.

In order to record the impressions, an endless band of paper is caused to unroll very close to this edge. The paper follows the motions of the sash. The band pressed between two cylinders turning with the wheelwork, unrolls four inches each revolution. In describing the process of transmission, we have seen that style *c*, at each revolution of the cylinder,

advances just four inches. Consequently the surface of paper unrolled in a given time is the same as the surface run through in the same time by the style on the surface of the message.

When the screw makes a revolution, the thread on the cylinder traces with ink on the paper band a transversal straight line. It is the same at each revolution. These successive transversal lines, at a distance of four inches from each other, form on the white paper band a blue ground. Thus the cylindrical helix is the recording part of the apparatus. In its rotation it offers successively only one

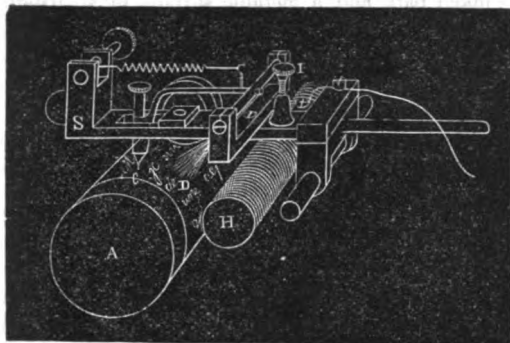


Figure 2.

point to the surface of the paper, and as the beginning of the thread is on the same line of commencement as the end, the revolutions follow each other without any loss of time.

At the lower part of the lever *G* is fixed a small electro-magnet *E*. Its soft iron bar serves the purpose of an armature for the permanent horseshoe magnet *F*, and has its extreme ends in juxtaposition with the poles of the latter. When a current passes through *E*, the ends of the bar take the polarities of the same denomination as the poles of the magnet, which stand in juxtaposition. Lever *G*, drawn back by a spring, is repelled; the edge leaving the contact of the helix, no mark appears on the paper.

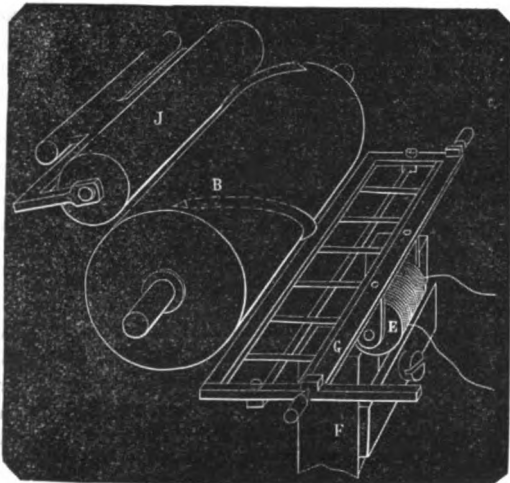


Figure 3.

When the current ceases for a longer or shorter time, then the magnet *F*, reassuming its power, attracts the bar of the electro-magnet; the lever is raised, and the paper is brought in contact with the thread of the screw. On the paper an ink impression appears during the interruption of the current. Thus it is the power of the magnet that makes the impression. The electrical part operating by repulsion, the function of the battery current is to annul the magnetic power.

We have shown in transmission, how, at each passage of the style on an inked part, the current of the battery goes to the line on its passing through the receiving apparatus. This current in each of

the two apparatuses excites a relay which operates by repulsion. This is an electro-magnet with feeble resistance oscillating between the two poles of a permanent magnet. The local battery operates by the breaking of a closed circuit. The message which is sent is reproduced in both apparatuses, in the sending as well as at the receiving.

It must be understood that the cylinder *A* and helix *B* make their revolutions in the same time. Pointer *c* consequently makes just as many revolutions on cylinder *A*, and at the same distance from each other, as the helix makes parallel lines. Owing to the synchronical movement, which governs both apparatuses, the course of the pointer exactly coincides with the rotation of the helix, whether style *c* is at the beginning, or in the midst, or at two-thirds of the paper band in the direction of the breadth. Consequently all the inked parts, which the style meets during the first revolution, are translated at the reception by strokes corresponding in length with the duration of the passage, and so with the following revolutions. These impressions, either dots or dashes, are replaced in the shape of parallel hatchings in the same order, in succession, as the writing or fragments of writing are presented under style *c*, and reproduce in its essential forms the exact image of the original message.

SYNCHRONISM.

The autographic reproductions require that both apparatuses set up at a distance be governed by a synchronical movement; that is to say, effect in the same time an identical unrolling. For this purpose the rotation speed of the apparatus is regulated by means of a conical pendulum. The latter is a bronze aluminium stem supporting a ball of a given weight. When two pendula so constructed are brought to the same diapason, then they describe obviously isochronal amplitude, keeping up the concordance of both apparatuses during several minutes, a space of time sufficient to proceed through the whole length of the cylinder. If the synchronism is accidentally disturbed, the motion imperceptibly deviates from the right side. The difference can be corrected by hand with the help of the little ball suspended on a string by means of a windlass. The synchronism is practically efficient, and the absence of any system of mechanical correction gives simplicity to the apparatus and renders its operation easy.

ELECTRO-STANNUS.

Several years ago a patent was taken out in London in regard to a process called electro-stannus, which is in reality a method of coating with tin objects intended for subsequent plating with silver, so as to give a body and reduce the amount of silver necessary to cover the original material. This is applicable to all kinds of iron substances, and has lately received an extended application. The principal difficulty has been to keep in solution the tin of the electric floating bath, as it has a tendency to fall to the bottom in the form of a precipitate. To prevent this, grain tin is dissolved in nitro-muriatic acid, or in nitric acid, and thus a solution of nitro-muriate, or nitrate of tin, is obtained. To this is added a solution of cyanide of potassium, and water, the quantity used being sufficient to precipitate the tin contained in the nitro-muriate or nitrate solution. The oxide of tin thus obtained is then washed with water in a filter, and either drained or evaporated to dryness, or used when of a pasty consistency. This oxide is then put into an earthenware pan, and as much sulphuric or muriatic acid, or sulphuric and nitric acid, is added as will take up the oxide and

hold the tin in solution. A mixture of two parts of muriatic acid to one part of sulphuric acid seems to give the best result. This solution of tin is put into the vat in which the articles to be coated or plated are immersed, and as much soft water added as will make a bath of the ordinary strength used in electroplating. This is now ready for use.

In addition to the use of this process, for coating new metallic objects, it has been extensively used in renovating worn and tarnished articles, experiments upon some that have been completely eaten into by rust showing that they can be so coated as to have the appearance of frosted silver. To accomplish this result, if the articles are of iron and very rusty, they are first placed in a bath of diluted sulphuric acid, after which they are immersed in a bath of potash and water made hot, which removes all the grease. They are then removed to the plating vats, which are of novel construction. At the end of the vat is a plate of metal in connection with one of the poles of a galvanic battery, while over it are metal bars in connection with an opposite pole. The articles intended for plating are then hung in the solution from the bars by means of copper wire, when galvanic action takes place, and they remain more or less time, according to thickness of the plating required. When withdrawn from the vat, the articles are of a dull whitish color, and need to be subjected to the action of a metallic brush, which is moistened with a cleansing solution if the dull appearance be not desirable. The articles thus treated have the appearance of silver with almost the cheapness of tin.

A SPARK ADJUSTER FOR THE HOLTZ MACHINE—*J. J. Minot*.—The author quotes the following method for obtaining different kinds of electric sparks from the Holtz machine:—Having insulated the outer coating of the two Leyden jars of the machine, connect short thick wires from them to two brass pointers or conductors, so arranged that the distance between them may be varied at pleasure. With this arrangement the following results were noted:—At first the conductors were placed in connection with each other, when it was found that a series of sparks were given off between the conductors of the machine: the sparks had for extreme length 20 c.m. They were large and luminous, passed only at intervals, and required a certain electric tension. The pointers connected with the outer coating of the Leyden jars were then drawn apart to 13 m.m., when a succession of fine thread-like sparks passed across the space separating the conductors of the machine, whereas there was no such appearance between the pointers connected with the jars. But at intervals a larger spark, not so bright as the normal spark of the machine, would jump across the conductors, and simultaneously with this a similar spark passed between the pointers. This fine line of sparks was found to have a peculiar form, being brightest and largest at the ends of the conductors of the machine, fading away to a lighter and redder tint, and being of a thread-like character in the space between the knobs of the conductors. It was found, if the distance between the conductor of the machine exceeded a little that between the pointers connected with the Leyden jars, that no large sparks passed between either set of conductors, but only a series of thread-like discharges; when less a similar result was obtained. When the pointers were but a few millimetres apart a continuous hoop-like discharge passed between them, which was not interrupted by the occasional passing of a bright spark, and was not coincident in path with the latter. By varying the distance of the pointers of the Leyden jars, the number and character of the sparks could be changed at will.

AN IMPORTANT LEGAL DECISION.

The decision announced from Chicago as having been given by Judge DRUMMOND in the United States Circuit Court, is of much more importance than will appear from the statements which accompany the announcement. The parties mentioned are the Atlantic and Pacific Telegraph Company and the Rock Island Railroad Company; but the real defendant is the Western Union Telegraph Company, and the case was conducted in their behalf by their Western attorneys, Messrs. WILLIAMS & THOMPSON, of Chicago. The circumstances connected with the case are as follows:

In July, 1866, Congress passed an Act which authorized any telegraph company incorporated under the laws of any State to construct, maintain, and operate lines of telegraph through and over any portion of the public domain of the United States, over and along any of the military or post roads of the United States which have been or may hereafter be declared such by Act of Congress, and over, under, or across navigable streams or waters of the United States. These privileges were granted upon the condition that any telegraph company desiring to avail itself of them should file a written acceptance with the Postmaster-General of the restrictions and obligations required by the Act, the most important one being an agreement to give the Government messages priority over all other business, and that the rates therefor should be fixed by the Postmaster-General. The Western Union, and all the other telegraph companies in the country, filed their assent to the restrictions and obligations of the Act with the Postmaster-General, and thereby became entitled to enjoy and exercise all of the powers and privileges conferred by it.

A few years ago, the late Postmaster-General Creswell expressed the opinion that the telegraph companies which had taken the benefits of this Act were entitled to construct and maintain telegraph lines along and upon the right of way of railroads within the States which had been declared post roads by Act of Congress, without making any compensation to the railroad companies for the use of the right of way, and notwithstanding the fact that a large majority of the railroad companies in the country were under contract with the Western Union Company for the exclusive use of their right of way of telegraphic purposes. Encouraged by this opinion of the Postmaster-General, the Southern and Atlantic Telegraph Company commenced the construction of a line along the right of way of the Orange and Alexandria Railroad Company in the State of Virginia. The railroad company, which was under contract with the Western Union Telegraph Company, interfered to prevent the erection of the competing telegraph line. Thereupon the Southern and Atlantic Telegraph Company applied to the United States District Court for the District of Virginia for an injunction to prevent any interference by the railroad company with the erection of the new line. At the request of the Postmaster-General, the Attorney-General of the United States was represented at the hearing, so that, in reality, the United States was the petitioner in a Federal Court for an injunction to restrain a railroad company from preventing the erection of a telegraph line that was to enjoy, without any compensation whatever, benefits and privileges for which the Western Union Company had contracted to pay, and was actually paying, a considerable sum annually. The surprise that this statement of facts would naturally excite will not be greatly increased by the knowledge that the injunction applied for under such extraordinary circumstances was granted. An

appeal was taken to the Supreme Court of the United States, which it is expected will be argued and decided within a few months.

The Atlantic and Pacific Telegraph Company have no lines between Chicago and Omaha. For more than a year past their business between those points has been done over a wire which the Union Pacific Railroad Company leased from the Western Union Company. The lease of this wire will expire in a few months, and it therefore becomes necessary for the Atlantic and Pacific Company to make provision for supplying its place. They have decided to do so by the erection of a new line, and the route selected was along the right of way of the Rock Island Railroad, which is under a contract for the exclusive occupation of its right of way by the Western Union Company. Failing to induce the railroad company to acquiesce either actively or tacitly, in their view of the case, the Atlantic and Pacific Company, applied to Judge Drummond, of the United States Circuit Court, a few weeks ago, for an injunction to restrain the Rock Island Company from interfering to prevent the construction of the new line on their right of way. This application has just been refused, and the decision of Judge Drummond sustains in every particular the claim of the Western Union Company, that the Act of 1866 gives telegraph companies, right of way only upon such military and post roads of the United States as are owned or exclusively controlled by the Government; that it does not include railroads which have been designated as post roads by other Acts of Congress; that neither under the Act of 1866 nor under any other Act can Congress take or authorize the taking of private property of a railroad corporation for the purpose of erecting and maintaining a telegraph line without compensation for the franchise so sought to be granted. If this decision is affirmed by the Supreme Court of the United States, which appears highly probable, it will increase largely the value, already great, of the Western Union Company's contracts for rights of way with railroad companies in the States.—*N. Y. World.*

NEW INSTRUMENTS EXHIBITED AT THE APRIL SOIRÉE OF THE ROYAL SOCIETY.

At a recent soirée of the Royal Society (being the first held in their new apartments) there was a remarkably good display of scientific apparatus, including the following pieces in the department of physics, some of which may possibly be new to American readers. Mr. Crookes exhibited his experiments showing the attraction and repulsion accompanying radiation. Messrs. Whitehouse and Latimer Clark, an electrical recorder for registering time, speed, distance, and number of passengers inside and out of tram cars and omnibuses. This information is registered in four parallel columns in red ink on long strips of paper by automatic pens. Dr. Tyndall exhibited the apparatus constructed by himself and his assistant, Mr. Cottrell, for showing the stoppage of sound by a non-homogenous mixture of air and vapors, and also experiments illustrating Savart's observations on the action of sound on a jet of water. Mr. J. Norman Lockyer exhibited a series of photographs of metallic and solar spectra enlarged from photographs taken by his new method of comparing spectra by means of a perforated shutter sliding in front of the slit of the spectroscope. Capt. J. E. Davis exhibited a sextant which will be found particularly useful in night observations, as it permits the taking of a series of observations without reading off any until the close of the series, this being accomplished by the adaptation of a micrometer movement to the tangent screw and the application

of indicators to the arc of the instrument. Messrs. Tisley and Spiller exhibited their compound pendulum apparatus in action, and distributed cards with the exquisite curves described upon them. Mr. E. B. Tylor's ingenious apparatus for illustrating refraction was shown, and Mr. Spottiswode's triple combination double image prism. Messrs. Negretti and Zambra exhibited their new ingenious upsetting thermometer for recording temperatures. Mr. G. P. Bidder's micrometer is described as a most ingenious device for observing the transit of very faint stars. The spider lines are illuminated by a side light, and are reflected into the eye-piece by a mirror, as bright lines upon a dark ground, and can be colored at pleasure by the interposition of colored glasses. The beautiful photometer of Sir Charles Wheatstone is worthy of special attention. The screen slides along the divided scale and its motion causes the increased overlapping of two sliding wedges of neutral tint glass. The light is looked at directly through a hole in the screen and the latter moved along on the scale until the light just ceases to be visible. Dr. Norris of Birmingham exhibited experiments showing that the statement that India rubber contracts by heat is incorrect. This substance, it is true, contracts in the direction of its length but expands in breadth at the same time, thus resembling the so-called contraction of muscular fiber.

A NEW BATTERY COUPLE.

By M. J. MORIN.

In a memorandum presented by me to the Academy on the 24th June, 1872, I described a sulphate of copper couple, which I proposed as suitable to therapeutics, and in which the precipitation of the copper was avoided both upon the diaphragm and upon the zinc. I was thus enabled to construct some elements which worked even after two years and a half. Unfortunately the electromotive force was exceedingly small; and though its use might particularly suit one method in the application of therapeutics, it would not be so suitable for another method. In some cases a few of the couples sufficed to furnish the necessary results, since the moderate intensity of the current was compensated for by its prolonged duration: in other instances, on the contrary, a very large number of the elements would be imperative, but required for a few minutes only.

It is with the object of evading the inconvenience attending the use of apparatus so bulky, and at the same time so costly, as evidenced in these latter instances, that I have just constructed a new couple whose electromotive force is much superior to that of the elements employed for therapeutics up to the present date. The couple I refer to has a great analogy to that of Bunsen's, to which it is scarcely inferior with regard to its electromotive force. Unlike Bunsen's element, in which the carbon is plunged into nitric acid, the carbon of this new element is surrounded with a chromic salt whose preparation is due to M. Faucher. This salt, barring the water, very nearly represents the chemical constitution of Jacob's solution.

An idea of the advantage of this new process may be conveyed by the statement that to produce a determinate effect the above apparatus is reduced to about one-eighth of the size of the sulphate of copper apparatus, and it does not require either maintenance or supervision. It is shut up, and consequently of easy transport. Moreover, one of these elements has been working for several months, and, having regard to its present condition, I hope its duration and constancy will yet last a considerable time.

CORRESPONDENCE.

To the Editor of the Journal of the Telegraph:

We think that the JOURNAL dismisses Mr. Debre's suggestions rather summarily, especially as regards the armature in common use to-day.

A case in point: The relay at this office is of the usual W. U. pattern, number 1,155, resistance 77 ohms. After using it for a long time, and exhausting a vast fund of patience in fruitless endeavors to make it respond to the delicate thrills of some fine operator's nervous system, we at last concluded to examine the armature, and see if we could not in some way improve its sensibility, if I may use the expression.

As a first step, we removed the wire which connects the armature with the local binding post, and fastened it to the further end of the adjusting spring, (which is also of metal,) thus relieving it of all friction from that source, except such as its mere weight upon the spring.

This seemed to obviate the main difficulty, as, since the change was made, we have been able to discover slight ground connections, or escapes, between this and the next station, the existence of which we were prone to discredit, when so informed in other times, as our relay then did not confirm the information.

A still greater improvement in this direction would be to have the relays so constructed as to admit of a double spring—one rear, one front—the former connected with one pole of the local battery, and properly soldered, of course.

So also of the trunnion, its points could be made to fit into watch jewels, and thus release the armature considerably more.

These suggestions are particularly applicable to relays of small resistance, even where the battery power is large; since in our case the wire from here to Galveston is only 800 miles long, and is worked by 50 Callaud cups here, and 80 in the latter place, no other wire being supplied from the battery at this point.

The relay in question is only one of fifty or more of the same pattern in which we have observed the same fault.

In conclusion we would ask, is it not the duty of the Company to see that its operators are supplied with instruments of the greatest exactness and finish? It would certainly derive the greatest benefit therefrom, both in the increase of facilities for working a "hard wire," and in the possible avoidance of a great many errors.

Those operators who have fretted and fumed for hours over what they at the time deemed a "sticky key," only to find out at last that an insensible armature was the sole cause of the trouble, will second us in the first inquiry.

As to errors, how many double l's, so sent, have been received m's? How many f's have been transformed into n's, and so on *ad libitum*, and all through the fault of an unwieldy armature?

D.

Answer.—A relay with only 77 ohms resistance is quite unsuited to your circuit. A wire 800 miles long and worked by a gravity battery of 80 cells ought to have relays of at least 150 ohms resistance in order to secure a practicable working magnetic power. If you will bring the matter to the attention of your superintendent we have no doubt that he will exchange your relay for one which will work well upon your wire without the aid of watch jewels for the trunnion points, or any other extraordinary appendage.

MITCHELL, IOWA, July 27, 1874.

To the Editor of the Journal of the Telegraph:

In reply to your article on Duplex Telegraphy in your issue of July 15th, 1874, I would say that in my description of the invention you refer to, for the sake of brevity I omitted to explain the point you criticize, believing it could be readily understood, as it is no new principle, being used by no less eminent electricians and inventors than Moses G. Farmer, of U. S., in his Letters Patent No. 26,097, and W. H. Preece, of England, in his *leakage* system of duplex, described in *The Telegraphic Journal* of October 1st, 1873, to wit: "But I make use of two distinct sets of wires, coils, or helices upon one or more electromagnets, and so arrange these sets that the current proceeding from the battery at any station shall flow through such an arrangement of the wires or helices of the electro-magnet that this current, alone or unaided, shall not be able to put in motion the armature of the relay at the transmitting station."—*Farmer's reissue*, No. 5,181, Dec. 10th, 1872. Also: "If, now, the pole piece of the iron core of the coil *P* be moved away, by means of an adjusting screw *s*, from the tongue *t*, until it is about twice as far off as that of *P'*, its influence upon the tongue will be the same, and the preponderating influence of the current in *A C* over that in *C B* will be destroyed, and therefore the relay will not be affected."—W. H. Preece.

Let us, for the sake of simplicity, assume that a current does flow to line, when closed, through relay, this current alone will not operate the relay if adjusted high enough.

SIMEON J. M. BEAR.

Answer.—The cases mentioned above are not at all analogous to yours. Farmer, for example, puts two coils of wire around each leg of the iron core of his relay—the one having twice as many convolutions of wire as the other—and arranges his key so that when only one operator is sending, the current at the sending station goes through the small coil, and the armature being adjusted above the attracting force of the relay, does not move; but when both stations are sending, double the current passes through the small coil, and works the armature. Here the equation is effected by adjusting the mechanical force of the spring so as to equal the attractive force of the magnet when acted upon by one battery through the small coil. What you propose to do is to produce a permanent equation of the outgoing current upon the receiving relay at the sending station, without the necessity of adjustment.

This problem is supposed to be solved by signaling with two batteries, both having their positive poles connected to line, and their negative poles to earth, each battery having the same number of elements. In one of the battery wires leading to the line is inserted the receiving relay; in the other battery wire is inserted a resistance equal to that of the relay.

Your supposition is that when both batteries are connected to line, no current will pass through the relay, for the reason that any tendency in the battery connected to the relay to set up a current, is balanced by the opposing current from the battery connected with the resistance coil. Were the line open this suggestion would be correct, but as it must necessarily be closed to effect transmission, it is obvious that both batteries will act as independent feeders to the main line, or as a main battery connected in two series for quantity, and the relay will close precisely as if no equation was attempted.

Suppose that your assertion—that although "a current does flow to the line, when closed, through the relay, this current alone will not operate the relay

if adjusted high enough"—be admitted, how high would the adjustment have to be, when the full force of your 50-cell battery was passing through the relay at the sending station, to prevent its operation, and what becomes of your assertion that "the outgoing current does not affect the relay R' at that station"?

In Farmer's system he adjusted above the force of the single current, when sent through the small coil, and when but one operator was sending the current at the receiving end was received through the large coil, which, possessing twice the magnetic power with the same battery as the small coil, overcame the retractile force of the spring and worked the armature.

Your invention possesses no such device, but sends the whole current from the sending battery through both coils of the relay.

CHICAGO, July 28, 1874.

To the Editor of the Journal of the Telegraph:

Will you be kind enough to inform me how many words *Rock Island Depot* should be counted, first understanding that *Rock Island* is the name of a city in this State, and that the railroad running from this city to that place is called the *Rock Island Railroad*, deriving its name from the city of *Rock Island*, and that the depot in this city is called the *Rock Island Depot*, and is counted sometimes three words? I claim that it is but two words, *Rock Island* being substantially but one and the same word—a compound word. The name of a city and the depot takes its name from the city of *Rock Island*, and does not strike me that it should be counted two words in the body of a message any more than *St. Louis*. I have a little curiosity in the matter to satisfy, as well as an argument between myself and an operator who works in the main office. By answering through the JOURNAL at your earliest convenience, you will much oblige,

T. O. CORD, *Dist. Manager*.

Answer.—The rule governing this case is very clear. Rule 9 says that names of persons and places, when given to *things*, must be counted according to the number of distinct words in each. A depot is a *thing* in this sense, consequently *Rock Island Depot* should be counted three words.

The same would also be correct as to *St. Louis* or any other name containing more than one word. We have answered substantially the same question many times.

To the Editor of the Journal of the Telegraph:

How many cells of Callaud battery are necessary to properly work a line ninety miles in length, with fifteen offices in circuit. Relays new, W. U. pattern. Please answer through JOURNAL and oblige H.

Answer.—A fair average working circuit will be had if the battery is equal to one cup for every 45 ohms external resistance. Applying this rule to this case:

90 miles of wire, say 30 ohms per mile.....	1,800
15 relays " 100 " each.....	1,500
Total.....	3,300

which, divided by 45, gives 74 as the number of cups necessary.

To the Editor of the Journal of the Telegraph:

Suppose we have two main wires designated as Nos. 1 and 2. If we insert wire No. 2 in local binding posts of relay on wire No. 1, will it have any tendency to ground No. 1, provided relay magnets are removed an eighth or sixteenth of an inch?

EXPERIMENT.

Answer.—No.

SUBMARINE CABLE ENTERPRISE.

From the Railway News.

At the meeting of the Telegraph Construction and Maintenance Company, a vote of thanks, as well timed as it was merited, was awarded to the officers and staff of the Company. Every neophyte on the London press starts with the idea that he is thoroughly competent to write a leading article or a dramatic criticism, and there are men like them, and like them mistaken, who consider the laying of a submarine cable the mere A B C of practical engineering. Those who entertain that idea we would advise to ponder well upon the fact that the Faraday, out since the 16th May last, has not yet—so far as can be ascertained—succeeded in laying more than 400 miles of cable in shallow water.

We learn also that there will be some delay and disappointment with respect to the completion of the Central American cable, which was taken out by the Hooper steamship. A circular issued last night by the Directors of the West India and Panama Company states that faults of so serious a character have developed themselves in their cable, that the Hooper is on her return home to have the entire cable overhauled. It is further stated that there is a fault in the cable which has already been laid from Para to Cayenne, so that the laying of the line on behalf of the Central American Company must be delayed for some months. To this may be added the further disappointment caused by the wreck of the Gomos in attempting to lay the River Plate cable by Messrs. Siemens, who are also the contractors for the Direct United States Cable Company.

In the absence of further and more detailed information it would be premature to attach blame to any persons, nor do we consider these casualties such as should cause any feeling of uneasiness as to the future of cable property. Comparisons are proverbially odious, but when we find that great delay, to say the least, has occurred in connection with the expedition of the Faraday in attempting to lay the cable in the North Atlantic, where cables have already been so successfully laid, that in the Southern Atlantic both ship and cable have been lost, and that in Central America a third disappointment has occurred, one cannot avoid contrasting the success which has invariably attended the proceedings of the Telegraph Construction Company with the failure of its younger rivals and competitors in the same description of work. We hope ultimately for better results, but in the meantime we are not surprised that the shareholders in the Direct United States, the Central American, and the River Plate cables should feel disappointed at failures which probably might not have occurred had experience similar to that gained by the officers and staff of the Telegraph Construction Company been enlisted in the important work of making and laying the cables to which we have referred. Judging from the difficulties which attend this description of enterprise, we cannot but feel that the acknowledgment of past services made by the shareholders of the Construction Company was a graceful and appropriate act, and no doubt on a suitable and convenient occasion they will be pressed to express in a more substantial form their sense of obligation for services which have accomplished so much for the cause of ocean telegraphy, and at the same time secured very satisfactory returns upon the capital invested.

The following is the circular of the West India and Panama Company above referred to:

SIR: I am instructed to forward for your information the following copies of communications which have been received from the Central American Tel-

egraph Company. The line between Para and Cayenne has been laid, and is in working order, but a fault is stated to exist on it about 109 miles from Para. This fault is in shallow water, and the steamship Great Northern is already ordered to the spot to effect the repairs. It will be borne in mind that by the terms of the contract no payment becomes due to the Central American Company in respect of either of the sections, Para to Demerara or Trinidad to Porto Rico, until its final completion and maintenance in perfect working order for thirty days have been certified to this Company by Sir William Thomson or Professor Jenkin.

I am, sir, your obedient servant,
CONSTANTINE M. HOOPER, Secretary.

Mr. Hooper, the Managing Director of Hooper's Telegraph Company, says:

"DEAR SIR: I have received a communication from Mr. France, our engineer-in-chief on board the Hooper, intimating that a portion of the cable intended for Cayenne, Demerara section, is faulty. I have no doubt but that the faults are purely mechanical, however occasioned, and although I believe they could be cut out at Para, yet rather than run any risk whatever, I have sent instructions for the ship to return home, when a thorough investigation of the facts, and a complete inspection of the cable, may be made at our works. The cable will be sent out again with the remaining section in October, so that the completion of the contract as a whole will not be delayed.

Faithfully yours,
W. HOOPER, Managing Director.

GLOBE TELEGRAPH AND TRUST.

The report states that in exchange for stocks and shares of other companies 119,004 preference and 120,722 ordinary shares of this Company have been allotted. Cash subscriptions have also been received for 5,291 preference and 3,841 ordinary shares, making the total subscribed capital at this date £2,488,580. The total revenue of the Company accruing from dividends on securities and from interest on loans, &c., amounts to £141,481 for the year, out of which £101,271 has been already distributed in interim dividends. The working expenses for the year amount to £1,267, leaving a balance of £38,943, out of which the directors now propose a distribution of 1½ per cent., or 8s. per share, upon both preference and ordinary shares, making, with the previous interim payments, a total dividend for the year of 6 per cent. on the preference, and of 5½ per cent. on the ordinary shares, carrying forward £1,614. In addition to the dividends credited in the accounts, the Company's revenue for the past year includes one-third of the quarterly dividend payable on 1st August next on its Anglo-American Telegraph stock. This sum, amounting to £3,539, will be credited in the next year's accounts. In accordance with Article 22 of the Articles of Association, Sir James Anderson, Julius Beer, Esq., and Sir George Elliot, Bart., M. P., will retire, but being eligible, they offer themselves for re-election. The auditors, William Newmarch, Esq., F. R. S., and John George Griffiths, Esq., also retire, but being eligible, they offer themselves for re-election. In conformity with the Articles of Association the annual remuneration of the directors and auditors is to be fixed by the meeting.

THE Managing Director of the Brazilian Submarine Telegraph Company states that a number of messages sent to St. Vincent on the 16th inst., were in time to catch the Cape steamer, which left Plymouth ten days previously, and he desires "to draw the attention of the commercial world to the advantages thus offered, in order that the respective steamship companies may be induced to arrange permanently to call at that station."

POST-OFFICE TELEGRAPHS.

In Parliament, July 25th, in reply to Mr. M'Laren, the Chancellor of the Exchequer said he was aware of the fact that the capital sum expended in the purchase and formation of the Post-Office Telegraphs, amounting at the 31st of December, 1873, to £9,465,197, had yielded a net revenue of only £95,956, or about 1 per cent. on the outlay. His attention had for a considerable time been directed to the general position of the Telegraph service, a subject of very great importance, involving an expenditure of great magnitude, and requiring very careful control and supervision. All expenditure upon new works or extensions out of capital had been stopped since October last, and no new works or extensions could now be undertaken except out of sums voted by Parliament. The Treasury exercised the same care and supervision in respect of the votes which might be proposed to Parliament for works in this service as in regard to any other expenditure for Government purposes. During the present year there had been very considerable strictness in revising the estimates, with a view to asking for as small a sum as possible. He was in constant communication with his noble friend, the Postmaster-General, for the double purpose of keeping as low as possible the expenditure upon new works, and reducing the expenses of management, and, at the same time, of providing as efficient a system of control as possible over any expenditure connected with this service. In reference to another point referred to in the question, he had to say that since the 31st of December last the Treasury had created stock to the amount of £325,000, and that of this sum about £70,000 was still in hand. The amount expended had been applied to the purchase of works which had been taken over, but not paid for. No part had been expended on extensions or new works. The honorable gentleman had asked, in conclusion, whether an estimate could be given of the probable amount which would still have to be paid to companies for telegraphs and rights acquired by the Post-Office. There were claims which were still under consideration and arbitration, and, therefore, in the interest of the public service, it would not be desirable to give an estimate of the kind suggested.—*London Times.*

UNSETTLED TELEGRAPHIC CLAIMS.

The report of the Directors of the Manchester, Sheffield and Lincolnshire Railway contains the following in reference to the unsettled claims against the British Government for the acquisition of the telegraphs:

"The telegraph claims are still unsettled, and the course taken by Government in regard to this question cannot be too strongly deprecated by the holders of railway property. It is most unfair that railway proprietors should be kept out of their just rights because the post-office officials have misled the country in regard to the cost of the acquisition of the telegraphs, and now endeavor to cover their mistakes by vexatious delays in settlement of claims in cases where they are unable to repudiate them altogether. To give an instance of this you will remember that the Directors reported to you at the last meeting that in the case of the South Junction Company the Marquis of Salisbury had awarded the sum of £6,479 as due from the post-office. The authorities contended that the award was informal, but upon its being proposed to refer the matter back to the Marquis of Salisbury, who was willing to rehear the question, the post-office authorities refused, and consequently offered a compromise of £5,000, which of course the Company declined, and they are now forced to the expensive and disagreeable alternative of commencing an action against the Crown to recover the amount awarded them."

TARIFF BUREAU.

SEMI-MONTHLY CIRCULAR.

EXECUTIVE OFFICE,
WESTERN UNION TELEGRAPH COMPANY,
145 BROADWAY, NEW YORK,
August 15, 1874.

To all Offices on W. U. Lines:

The following changes and additions have been made since the date of the last circular:

GENERAL INFORMATION.

Wetumpka, Ala., closed.
Maine Prairie, Cal., reopened.
Hereafter, the "tariff for other lines," from Los Angeles to Wilmington, Cal., will be 30 10.
Laurel, Del., closed.
Waynesboro, Ga., reopened; square 175.
Howlett, Ill., changed to Riverton.
The following offices in Kansas have been re-opened:
502 Blue Rapids. 456 Muscotah.
502 Centralia. 465 Netawaka.
456 Effingham. 513 Waterville.
502 Frankfort. 465 Wetmore.

The name of the office at *Highland Station, Kansas*, is incorrectly given in tariff book as Highland. Messages for Highland will be mailed from the office at the station, unless directions are given by the sender of messages for their special delivery.

Hereafter, messages for the following "other line" offices in Kentucky will be sent *via* Louisville, instead of *via* Elizabethtown. The "tariff for other lines" is given, with the name of the office:

Beaver Dam.....50 3	Litchfield.....50 3
Big Chitty.....50 3	Mercers.....50 3
Cecilian Junc. (Cecelia in tariff book).....40 3	Millwood.....50 3
Caneyville.....50 3	Owensboro Junc.....10 3
Greenville.....50 3	Rockport.....50 3

Messages for West Point, Ky., (office just reopened), are sent *via* Louisville only, "tariff for other lines" 35 and 3.

The office given as Lenox Village, Mass., in tariff book, should read Lenox.

New Bloomfield, Mo., closed.
Jackson and White Mountain House, N. H. (Summer offices), will not be reopened this Summer.
Chittenango Springs, N. Y., closed.
Five Mile Point, Otsego Lake, N. Y., reopened; square 57.
High Point, N. C., closed.
Morristown, O., closed.
Marion Sta., Oregon, reopened.
Cresson Springs, Pa., reopened.
Littlestown, Pa., is now a W. U. office, square 85; check direct.
Phillipsburg, Clarion Co., Pa., closed.
Phoenixville, Pa., closed.
Summit Hill, Carbon Co., Pa., reopened.
Messages taken for Dalton, Luzerne Co., Pa., should be sent to Abington, Luzerne Co., from which office they will be delivered. Charges for delivery, 25 cents.
Cedar Hill, Tenn., reopened; square 283.
The P. O. A. of Allegheny Depot, Va., is Shawsville.
Martin's Bluff, Washington Territory, closed.
Tenino, Washington Territory, closed.
Victory, Wis., closed.
Carbon, Wy., is now a W. U. office, square 564; check direct.

NEW OFFICES.

441 Prescott, Ark.
Atula, Cal.
Gandaloupe, Cal.
* Grimes' Landing, Cal., 30 10 Colusa.
* Nederland, Bourbon Co., Col., 40 3 557 Central City.
327 Osman, Ill.
316 Richmond, Ill.
387 Riverton, Ill., formerly Howlett.
272 Scottsburg, Ind.
346 Elk River Junc., Iowa.
346 Midland Junc., "
* Bear Creek, Ky., 25 2 303 Catlettsburg.
* Horse Branch, Ky., 50 3 263 Louisville.
* Pleasant Ridge Park, Ky., 25 2 263 "
223 Thomson, Ky.
* Tiptop, Ky., 40 3 263 Louisville.
* Vine Grove, Ky., 40 3 263 "
53 Pitman Grove, N. J.; check Glassboro.
33 Sea Cliff, L. I., N. Y.
5 Avondale, N. S.
66 East Port Carbon, Pa.; P. O. A. Port Carbon.

140 Crisswell Sta., Pa.; check Petrolia City.
140 Moore Farm, Pa.; check Petrolia City.
121 Pennfield, Pa.
59 Sharon Hill, Pa.
133 Bath Alum Springs, Va.

* Clark's Gap, Va., { 85 2 77 Alexandria.
75 5 133 Staunton.
* Orkney Springs, Va., { 70 4 77 Alexandria.
40 3 123 Staunton.

In several of the States there are two or more offices having the same name. Such offices should always give the name of their *County* in the date of messages they send, to avoid errors in checks.

East Nanticoke, Pa., closed in JOURNAL of June 1, 1874, should read Nanticoke.

Beaverkill, Ulster Co., new office on other lines, given in last JOURNAL with tariff from Rondout, is in New York.

NOTICE TO OFFICES IN SQUARE 41.

The tariff from Square 41 to Square 250 is \$1.00. Offices whose tariff sheets show a different rate will make the necessary correction.

TO OFFICES IN SQUARES 45, 120 AND 129.

On and after August 17th, 1874, the tariff between Square 45 and Squares 120 and 129 will be 50 cents instead of 75 cents, as at present.

TO OFFICES IN SQUARE 358.

The tariff from Square 358 to Square 92 is \$1.35. Offices whose tariff sheets show a different rate will make the necessary correction.

ATLANTIC CABLE BUSINESS.

Notice has been received that the telegraph line between Rio de Janeiro and Montevideo, in South America, is ready for messages. The tariff to Montevideo is \$38.75 for twenty words or less, and half this amount for each additional ten or fraction of ten words, in addition to the ten word rate to London.

Messages for Buenos Ayres and Chili should be addressed, as at present, to "Oldham, Montevideo." The tariff, until further notice, will be the same as the rate above given to Montevideo. The charges beyond Montevideo will be collected from the receiver.

The cable between Shanghai and Nagasaki is broken. Messages for Japan will, until further notice, be forwarded *via* the only remaining route, viz., "via Siberia." No indication of route for messages to Japan is therefore at present necessary.

WILLIAM ORTON, *President*.

THE TELEGRAPHERS' MUTUAL BENEFIT ASSOCIATION.

ASSESSMENT No. 66, ISSUED AUG. 14, 1874.

DEATH OF THOMAS A. ENGLISH AND ROBERT B. DILLON.

Thomas A. English (Certificate No. 1682, issued Nov. 25, 1872) died at Covington, La., June 18, 1874, of consumption.

Robert B. Dillon (Certificate No. 2060, issued June 11, 1873) died at New Orleans, La., July 19, of consumption.

Members holding certificates numbered up to and including No. 2263 will remit for the above assessment.

By the policy adopted at the last annual meeting, a balance appears in the hands of the Treasurer sufficient to pay the assessment which would otherwise have been called for on one of the two deaths now announced. Only one assessment of ONE DOLLAR, therefore, is called for, the other to be paid from the funds of the Association. After payment of this latter claim, there will be still in the hands of the Treasurer, as the permanent fund of the Association, about \$3,000.

As the anniversary of the Association approaches, it is recommended that early arrangements be made for a large representation thereat, and that such modifications of existing rules as may seem needful

be prepared and studied prior to that meeting. The annual meeting will be held at 145 Broadway, New York, November 11th, at 5 P. M.

ACKNOWLEDGMENT OF RECEIPTS FOR ASSESSMENT NO. 65, UP TO AND INCLUDING AUGUST 10, 1874.

6, 15, 31, 33, 52, 55, 58, 70, 76, 80, 84, 90, 95, 97, 98, 99, 100, 103, 120, 121, 122, 141, 142, 143, 144, 153, 154, 156, 158, 160, 164, 171, 175, 179, 183, 189, 190, 191, 193, 197, 198, 206, 218, 227, 230, 245, 248, 252, 274, 276, 280, 316, 341, 353, 357, 360, 362, 364, 366, 382, 418, 436, 430, 431, 466, 468, 469, 470, 471, 475, 476, 478, 483, 484, 510, 511, 512, 514, 556, 557, 560, 561, 566, 569, 573, 574, 586, 590, 605, 617, 618, 643, 646, 649, 655, 659, 662, 663, 664, 665, 667, 669, 671, 694, 710, 712, 717, 723, 724, 728, 730, 733, 750, 761, 756, 780, 781, 782, 783, 785, 786, 799, 802, 803, 812, 813, 823, 831, 836, 838, 843, 855, 870, 871, 874, 875, 876, 897, 901, 904, 905, 906, 926, 933, 943, 944, 949, 954, 957, 959, 963, 964, 972, 977, 979, 991, 992, 1014, 1016, 1030, 1031, 1033, 1034, 1040, 1041, 1046, 1050, 1057, 1063, 1069, 1073, 1074, 1076, 1083, 1090, 1098, 1100, 1101, 1105, 1106, 1107, 1108, 1109, 1110, 1112, 1113, 1115, 1117, 1119, 1120, 1122, 1123, 1127, 1131, 1139, 1141, 1164, 1190, 1198, 1204, 1205, 1211, 1217, 1231, 1235, 1234, 1237, 1238, 1243, 1256, 1263, 1270, 1274, 1277, 1281, 1282, 1283, 1284, 1285, 1286, 1288, 1292, 1294, 1298, 1304, 1336, 1353, 1354, 1355, 1356, 1371, 1375, 1376, 1398, 1405, 1406, 1417, 1418, 1421, 1423, 1430, 1432, 1433, 1443, 1445, 1469, 1471, 1474, 1475, 1476, 1483, 1485, 1497, 1498, 1505, 1508, 1523, 1539, 1590, 1537, 1546, 1558, 1563, 1576, 1579, 1582, 1596, 1597, 1616, 1626, 1649, 1652, 1660, 1661, 1663, 1663, 1665, 1667, 1672, 1673, 1684, 1687, 1688, 1696, 1699, 1700, 1701, 1702, 1704, 1707, 1709, 1710, 1713, 1714, 1718, 1721, 1724, 1736, 1727, 1728, 1733, 1746, 1747, 1750, 1751, 1753, 1754, 1756, 1757, 1758, 1769, 1780, 1785, 1786, 1787, 1788, 1789, 1771, 1783, 1789, 1791, 1802, 1810, 1813, 1815, 1818, 1828, 1830, 1839, 1840, 1841, 1844, 1845, 1847, 1857, 1858, 1859, 1860, 1863, 1864, 1869, 1895, 1896, 1897, 1898, 1898, 1953, 1954, 1962, 1972, 1973, 1986, 1992, 1993, 1996, 1997, 2005, 2007, 2010, 2012, 2022, 2023, 2024, 2026, 2033, 2041, 2053, 2074, 2075, 2084, 2085, 2089, 2093, 2094, 2098, 2099, 2102, 2108, 2109, 2112, 2120, 2131, 2136, 2156, 2157, 2159, 2165, 2166, 2167, 2168, 2171, 2180, 2183, 2184, 2185, 2198, 2206, 2210, 2211, 2215, 2217, 2220, 2225, 2226, 2227, 2230, 2231, 2234, 2235, 2245, 2246, 2254, 2256.
62.—790, 1275, 1542,
63.—1601.

Members of the Association who look to the JOURNAL OF THE TELEGRAPH for receipt of assessments paid, will please take notice, that an acknowledgment of the receipt of one assessment should be taken as a receipt for all previous assessments.

RESOLUTIONS OF RESPECT AND SYMPATHY.

At a meeting of the employes of the Western Union Telegraph office in Washington, D. C., held Thursday, July 30, the following resolutions were adopted, in reference to the death of Mr. James T. McCook.

Whereas, We are called upon to perform a sad and mournful duty, God in his infinite wisdom having removed from our midst, by death, our late pleasant companion and co-laborer, James T. McCook, an operator in this office, who died on the evening of Tuesday, July 28, 1874; therefore, be it

Resolved, That we deeply deplore the loss of our late associate, and desire to place upon record this expression, as a tribute of respect, our appreciation of his worth and good qualities, and our deep regret that one of our number, so young and promising, should be stricken down thus early in life.

Resolved, That our heartfelt sympathy and condolence is hereby extended to the family of the deceased in their severe affliction.

Resolved, That a copy of these resolutions be forwarded to the mother of the deceased, and furnished to the telegraphic journals for publication.

J. B. AUSTIN, *Sec'y*.

THE TELEGRAPHIC SYSTEM IN THE ISLAND OF CUBA.

There are twenty-four different telegraphic circuits established in the island of Cuba, and the number of telegraph offices exceeds 200. Cuba also forms the center of an important submarine telegraphic system, consisting of three cables—that from Havana to Florida; that from Batabano to Santiago de Cuba, belonging to the Cuba Submarine Telegraph Company, and that from Santiago de Cuba to Jamaica, belonging to the West India and Panama Telegraph Company.

COMPARATIVE STATISTICS OF GOVERNMENT TELEGRAPHS FOR 1872.—From Official Reports.

STATISTICAL OBJECTS.	Germany.	Bavaria.	Wurtemb'g.	Austria.	Hungary.	Belgium.	Denmark.	Spain.	France.	Gr't British.	British Indo-European.	British Indian.	Italy.	Norway.	Portugal.	Holland.	Dutch East India.	Russia.	Sweden.	Switzerland.
I.—SYSTEM.																				
Length of Lines in Miles.....	17,661	4,256	1,378	11,985	7,781	2,853	1,599	7,287	29,451	29,878	3,378	15,568	19,087	4,019	1,990	2,089	2,843	34,914	4,371	3,439
“ “ Wires in Miles.....	60,816	13,575	3,000	31,510	26,334	10,947	3,988	16,572	79,680	99,918	3,414	31,040	41,543	6,247	3,550	6,992	3,458	68,858	11,196	7,887
II.—OFFICES.																				
Number of Offices—																				
Open for Internal and Inter-																				
national Service.....	3,068	755	230	1,657	764	532	108	214	3,463	5,474	10	511	1,318	148	130	281	51	457	190	707
Open only for Internal Ser-			4	2	.....	.....	61	1	.....	.....	.....	259	.....	.....	.....	1	.....	876	130	.....
vice.....																				
Total.....	3,068	755	224	1,659	764	532	169	215	3,463	5,474	10	770	1,318	148	130	282	51	1,333	320	707
Number of Offices—																				
Government.....	1,391	392	.....	712	246	405	105	213	2,071	3,654	10	108	780	95	111	145	51	650	111	689
Railroad or private companies	1,067	363	.....	945	418	117	62	1	1,257	1,815	.....	567	497	52	1	137	.....	681	269	78
Scraphical with telegraph-	.....	.....	.....	2	.....	.....	2	1	135	5	.....	5	32	1	8	.....	.....	2	.....	.....
cal service.....																				
Total.....	3,068	755	224	1,659	764	532	169	215	3,463	5,474	10	770	1,318	148	130	282	51	1,333	320	707
Number of Offices—																				
With permanent service.....	30	6	2	47	78	13	2	75	10	35	6	610	70	1	6	3	.....	686	3	5
“ full day “.....	1,960	26	139	363	1,089	160	125	55	1,831	5,413	.....	96	203	103	44	183	16	76	351	46
“ limited “.....	1,068	723	88	1,249	536	349	42	85	1,622	26	4	94	1,045	44	70	96	35	296	268	656
Total.....	3,068	755	224	1,659	764	532	169	215	3,463	5,474	10	770	1,318	148	130	282	51	1,333	320	707
Number of Depot Offices.....			2	13	.....	278	.....	.....	.....	31	.....	.....	4	.....	.....	.....	.....	142	4	54
III.—APPARATUS.																				
Number of Apparatuses in Use :																				
Morse System.....	3,157	704	368	1,245	1,069	874	207	408	2,430	1,734	30	533	1,511	187	175	325	89	1,480	444	933
Hughes.....	88	10	4	40	8	14	.....	.....	1,917	26	.....	.....	39	65	.....	20	.....	76	.....	22
Other Systems.....	8	475	.....	.....	.....	22	.....	.....	1,510	5,782	.....	.....	.....	.....	12	.....	.....	.....	192	.....
Total.....	3,253	1,189	372	1,285	1,081	910	207	408	4,147	7,542	30	533	1,550	252	187	345	89	1,555	636	955
IV.—PERSONNEL.																				
Chief and Central Administra-																				
tion Officers.....	261	25	11	163	83	50	16	31	376	644	36	465	225	22	59	40	19	255	20	28
Number of Office Employees.....	4,519	218	87	1,351	1,039	694	251	956	3,303	6,323	79	927	1,769	344	359	612	171	3,421	388	1,055
Subaltern personnel.....	789	79	30	1,236	283	896	141	839	1,581	3,609	344	1,322	1,536	216	232	202	165	1,805	173	51
Total.....	5,569	322	128	2,750	1,405	1,580	408	1,826	5,260	10,576	459	2,714	3,530	582	650	914	355	5,481	531	1,134
V.—MESSAGES.																				
Interior Service—																				
No. of messages (paid) sent.....	6,511,375	539,444	228,585	2,818,697	2,013,471	1,585,196	287,902	839,446	5,395,782	15,369,894	.....	606,264	3,308,866	344,695	177,856	1,217,897	188,060	2,527,468	551,802	1,480,757
“ “ (free) “.....	272,158	61,110	.....	3,714	2,530	4,148	.....	182,315	698,700	165,886	.....	5,008	147,730	.....	32,993	.....	12,221	24,235	12,017	17,538
Total.....	6,783,533	600,554	228,585	2,822,411	2,016,001	1,589,344	287,902	1,021,761	6,004,482	15,535,780	.....	611,302	3,456,596	344,695	210,789	1,217,897	200,281	2,551,703	563,819	1,498,295
International Service—																				
No. of messages sent abroad.....	1,443,972	334,068	168,868	715,090	82,995	310,261	107,438	93,538	827,581	1,032,216	.....	25,849	337,700	95,657	32,953	274,728	5,156	246,080	111,788	251,707
No. of messages received from	1,554,079	362,841	181,167	698,721	87,344	350,262	109,331	102,315	914,153	869,107	.....	24,613	364,485	111,659	34,954	310,223	5,361	250,679	113,311	246,597
abroad.....	354,739	278,768	47,394	501,189	170,522	157,496	130,881	37,049	306,207	.....	.....	27,632	161,254	22,330	10,735	215,885	1,772	27,577	62,601	150,158
No. of messages sent transit.	3,392,790	975,677	397,429	1,855,600	340,861	818,019	346,650	232,892	2,047,941	1,571,323	.....	78,004	883,499	239,646	78,642	800,836	12,189	524,266	287,505	648,462
Total.....	21,718	.....	176,287	118,116	258,086	790,711	18,765	49,607	.....	.....	.....	36,945	125,379	30,355	29,849	12,416	16,181	153,563	893,874	25,111
Total General of messages.....	10,138,041	1,576,231	802,301	4,796,127	2,614,948	3,198,074	603,317	1,304,290	8,052,463	17,407,103	20,199	726,341	4,445,474	604,696	319,280	2,081,089	228,651	3,259,552	1,715,288	2,171,858
VI.—RECEIPTS.																				
Proceeds of Interior correspond-	\$1,227,414	\$63,411	\$28,412	\$1,304,163	\$498,643	\$164,816	\$46,913	\$206,447	\$1,259,298	\$3,905,825	\$.....	\$503,682	\$896,758	\$114,053	\$46,014	\$151,493	\$112,717	\$2,776,671	\$150,536	\$158,940
“ “ Internal “.....	1,020,973	143,639	27,824	1,021,787	56,270	172,088	79,445	148,436	1,021,787	882,995	.....	258,057	419,449	83,135	21,630	106,468	7,032	591,740	116,631	139,285
Sundry receipts.....	25,862	1,829	2,019	725,572	25,508	487	3,029	.....	150,662	219,510	.....	11,696	14,330	1,658	2,303	.....	273	55,622	3,064	20,060
Total.....	\$2,274,250	\$207,879	\$76,255	\$1,429,735	\$580,421	\$339,914	\$129,387	\$354,883	\$2,531,747	\$5,085,330	\$232,377	\$863,435	\$1,253,537	\$198,846	\$69,847	\$257,961	\$120,622	\$3,424,042	\$270,261	\$318,284
VII.—EXPENDITURES.																				
Extraordinary Budget—																				
Expenses for the construction																				
of new lines.....	\$206,530	\$37,548	\$37,573	\$384,906	\$116,996	\$61,877	\$16,631	.....	\$223,800	\$5,655,875	\$77,700	\$731,056	\$121,285	\$36,499	\$3,715	\$37,266	\$12,620	\$928,606	\$56,550	\$19,000
Ordinary Budget—																				
Personnel.....	1,566,459	87,305	48,805	844,044	452,919	210,224	85,853	\$591,900	1,900,000	4,565,445	297,165	1,245,879	704,350	111,262	137,811	375,186	160,744	1,482,590	143,321	167,313
Expenses of working and																				
maintenance of lines and																				
offices.....	659,813	49,434	26,469	553,550	330,919	144,670	30,502	105,976	639,000	.....	95,630	103,598	264,451	64,757	24,492	.....	49,418	1,099,999	54,091	124,115
Total.....	\$2,432,802	\$164,287	\$112,747	\$1,782,500	\$890,894	\$416,771	\$132,086	\$697,876	\$2,762,800	\$10,224,320	\$440,485	\$2,080,533	\$1,090,086	\$312,458	\$166,018	\$412,452	\$222,782	\$3,411,195	\$253,962	\$310,428
GENERAL OBSERVATIONS.																				
Population according to census.	31,278,253	4,852,026	1,818,484	20,394,496	15,417,227	5,113,680	1,784,741	16,732,052	36,102,921	31,628,398	.....	236,532,542	26,801,154	1,768,000	3,829,618	3,637,279	20,062,890	75,394,471	4,350,402	2,670,345

Journal of the Telegraph.

This Journal is issued on the 1st and 15th of each month. Its circulation is over 8,000. It goes to every State, Territory and Province on the Continent. It has become a necessity, and is always welcomed as a friend. No better medium for advertising exists.

TERMS:

TWO DOLLARS PER ANNUM IN ADVANCE.

Address—

JOURNAL OF THE TELEGRAPH,

Western Union Telegraph Company,

145 Broadway, New York.

NEW YORK, AUGUST 15, 1874.

INCREASE IN POSTAL FACILITIES.

With the view of increasing postal facilities in New York City, Postmaster James is about to establish telegraphic communication between the General Post-office and the various sub-stations. Stations D, (at Cooper Union), and F, (at Twenty-fifth street and Third avenue), will be the first to receive the benefit of the change, arrangements having been made with the Gold and Stock Telegraph Company to connect them at once by wire with the General Office.

JOSEPH PRIESTLEY.

It appears singular that at the centennial celebration of chemistry, at the home of Priestley, at Northumberland, Pa., no reference was made by the many speakers to the important labors and experiments of the discoverer of oxygen gas in the kindred science of electricity. Dr. Priestley was no less an electrician than a chemist. He it was who first determined the comparative power of the different metals as conductors of electricity. Many of his experiments in electricity are detailed in the "History of Electricity" published in 1767, and of which he was the author.

The *Tribune*, in an article on the Postal Telegraph scheme, which a sub-committee of the House Committee on Appropriations is to investigate during the Congressional recess, says:

"It is, of course, possible that this wild scheme for improving our defective and ill-organized postal service by precipitating upon it ten times as complicated and difficult work, may have a ghost of a chance in the thieves' carnival which the next session of Congress is expected to develop. But we shall hope for better things."

MANAGERS of offices will please give particular attention to the article in another column, entitled "Government Messages." The treatment of the class of business therein referred to must conform strictly to the directions laid down.

GOVERNMENT MESSAGES.

Some misapprehension still exists as to the proper course to be pursued in regard to government messages. Managers sometimes send them collect, and occasionally one is reported as refusing to send them at all unless prepaid in cash. Questions also frequently arise between managers and government officers as to whether messages offered as government dispatches are really entitled to be sent as such. In order that this matter may be clearly understood we are authorized to state that all messages relating to the affairs or business of the United States, offered for transmission by any of its civil or military officers or agents, will be received without pre-payment being exacted, and will be forwarded promptly, priority being given them over all other business. The tariff on all government messages, except regular scheduled weather reports, will be computed as follows: One cent per word for each two hundred and fifty miles or fractional part thereof. All words to be counted, except the date and the place where the message is filed; provided, however, that no message shall be counted as less than twenty-five words for each circuit. Distances will be computed by the tables of the Post Office Department, which tables will be furnished to all offices upon application to the District Superintendents. All such messages will be entered as paid at the office where they originate, and the bills will be presented monthly, as heretofore. In cases of inability to collect, a duplicate of the account, officially certified by the proper government officer, and the originals of messages, will be forwarded, with the monthly account current, to the Auditor, credit being taken therefor as cash.

Whenever a message is presented by an officer of the government to be sent at government rates which the manager of the office has reason to think is not upon government business, he is authorized to request the person presenting it to endorse upon it the word *official*, for the transmission of which no charge will be made. In case of refusal to endorse the word *official* on the message, the manager will accept and transmit the message and report the facts to the Superintendent.

Some managers fail to observe the fact that when the number of words in a government telegram is less than twenty-five, that twenty-five words should be charged for. Other managers have the impression that while no government message should be charged for less than twenty-five cents for transmission over a single circuit, yet when a message having less than twenty-five words is transmitted over two or more circuits, the charge is to be made upon the actual number of words contained in it, instead of upon twenty-five words. Thus, if a government message containing fifteen words is transmitted over two circuits, they would erroneously charge but 30 cents instead of 50 cents. All managers will bear in mind that the lowest rate for the transmission of any government message, is twenty-five cents for each circuit of two hundred and fifty miles, or fractional part thereof.

THE CINCINNATI INDUSTRIAL EXHIBITION.

We have received from the Commissioners of the Cincinnati Industrial Exposition a pamphlet containing their rules and premium list for 1874. The Exposition is to open on Wednesday, September 2d, and continue until Saturday, October 8d. The halls and grounds are now open for the reception of articles for exhibition, and will remain so until Tuesday, September 1st. At the Exposition of 1873, eighteen premiums were awarded for electrical and telegraphic apparatus, twelve of which were carried off by exhibitors from New York City. This year twenty-three premiums are offered, which will, doubtless, cause a spirited competition among the manufacturers of this class of apparatus. The list is as follows:

Best system of Fire Alarm Telegraph (in operation).....	Gold Medal.
Best Adaptation of the Telegraph to domestic use.....	Silver Medal.
Best Electric Engine, motor for light work.....	"
Best Telegraphic Railway Signals.....	"
Best Fire Alarm Signal Box.....	"
Best Telegraph Instrument for Stock Quotations.....	"
Best Set of Instruments for Electrical Measurement.....	"
Best Battery for force, durability and economy..	"
Best Electric Light.....	"
Best Ship Telegraph, electric or pneumatic.....	"
Best Electric Hotel Annunciator.....	"
Best Combination of Morse Instruments.....	Bronze Medal.
Best Box Relay with Key.....	"
Best Pocket Relay.....	"
Best Morse Register.....	"
Best Single Cut-out.....	"
Best Switch for 4 to 20 wires.....	"
Best Sounder.....	"
Best Key.....	"
Best Electro-Magnetic Motor.....	"
Best Electric Watchman's Clock.....	"
Best Dial Instrument.....	"
Best Lightning Rod.....	"

THE AMERICAN INSTITUTE FAIR.

The forty-third exhibition of the American Institute will be held in the Institute building, at Sixty-third street and Third avenue, in this city, beginning September 9th, and closing on Saturday, November 14th. The building will be opened for the reception of machinery on Monday, August 17th, and for the reception of other goods on August 31st. Articles may be entered until September 14th. One gold medal—the Medal of Progress—two silver medals, and one of bronze, are to be awarded, besides the diplomas. In addition to these, there is the Great Medal of the American Institute, awarded only to the discoverer or inventor of a machine, product, or process which shall have been proved, by long continued operation and practical adaptation, to be so important in its use or application as virtually to supplant every article or process previously used for accomplishing the same purpose.

It is to be regretted that so little encouragement is offered by the managers of the Institute for the exhibition of electrical and telegraphic apparatus. Of late years the display of this class of machinery has been very meagre. Thus a great attraction is lost to the Fair. At Cincinnati the electrical department is the great feature of the Expositions, and it is a suggestive fact that in 1873 twelve premiums in this

class were awarded to New Yorkers who had no representation at the Institute Fair—an exhibition of national reputation and held at their very doors.

THE NEW CODE OF RULES.

The following suggestions have been provided for us respecting a very important branch of the service, which we print as received. We request all who have had practical experience in work of this kind to criticise them closely and suggest, if possible, a better way.

REPAIRING CABLES.

1.—No portion of a cable should be exposed to the sun or air, but should be carefully covered all the way from where the water is at its lowest mark to where the connections are made with the air line.

2.—The shore end of cables should be carefully boxed or bedded. Where a cable is led up a shore make a trench of good depth from below low water mark to the building or box where it terminates. Encase the cable in a double box, so that, if possible, no part of the cable can be alternately wet and dry. Cover with solid plank and stone. At draws where the cable comes up direct from the water to the connecting box, that part of the cable from below the lowest water mark to the highest must be carefully wrapped with such material as the electrician may direct.

3.—Lightning arresters must be kept at all times attached to each conducting wire of a cable where air line connections are made.

4.—In repairing cables, it is first of all necessary that the hands of the repairer be absolutely clean. No grease, water, or dirt of any kind must be allowed to touch the gutta percha, or the parts to be connected. The fingers will be used as little as possible.

5.—In making a joint do as follows: First, free about four inches of the conducting wire from the gutta percha covering, untwisting and separating the wires forming the core and straightening them. In removing the gutta percha, be careful not to nick the wires, and leave the end of the gutta percha of equal length around the core. The separate wires are then carefully tinned by the use of a good soldering iron carefully heated, rosin, and solder in which tin is in good proportion. If there be five wires forming the core, cut three of them so that they shall protrude one and a half inches from the solid gutta percha covering, the remaining two being left the full length for wrapping. Draw the wires together so that the three short wires shall lap each other about three-quarters of an inch, and which will then be soldered together without wrapping. The two free wires of each end will then be neatly twisted from the center, each wire passing round the core at least three times, giving the joint, when done, the appearance of a single wire wrapped six times around the core from the center of the joint on each side, the whole joint being about half an inch long. The ends are then cut off closely, and the points carefully compressed and rounded so that no points appear.

When this is done, use the soldering iron over the whole joint, without applying additional solder, until the contact is seen to be perfect and smooth. All this must be done with the utmost care; first, not to over-heat the wire, and, second, to see that the tinning is made on a perfectly clean and dry surface, and the contact of the joint perfect.

When this has been carefully done, scrape or pare off with a sharp knife the outside of the gutta percha coating of each wire for about two inches from the naked wire and tapering thereto, so that the gutta percha shall be absolutely clean, otherwise it will not unite with the wrapping. Failures are generally the

result of want of cohesion between the new gutta percha wrapping and the old, caused by unclean or wet surfaces.

6.—Before proceeding to cover the wires, the ends and soldered joint are first cleaned with naphtha, then a stick of Chatterton's compound warmed, and a small quantity put on the joint and properly tooled over, so as to cover the joint equally. Before applying the tooling iron it is carefully wiped.

The ends of the gutta percha are then slightly warmed, and the actual end nipped off with the fingers. One side of the percha is then well warmed for about two inches back, and then brought forward over the joint to the opposite side with a twisting motion by the moistened fingers; the opposite end, after heating, should then be brought forward over the other part in a similar manner as far as it will go, and the percha is again warmed and kneaded with the fingers and thumb.

After kneading, it is again warmed slightly with the spirit lamp. The compound is then heated and applied over the gutta percha, by putting the compound stick on the percha, and rolling it along. The compound is warmed and applied a sufficient number of times to go thoroughly over the percha. The joint is again warmed, and the compound properly tooled until it covers the joint uniformly.

A sheet of gutta percha, well cleaned (the gutta percha sheeting as supplied to jointers is cut into strips four inches long and kept carefully in a bag or case), is then warmed, and a piece of about one inch long cut off with a pair of scissors, whose edges are moistened against the lips. The joint is then warmed with the lamp and also the piece of sheet, which is then applied to one end of the joint, half an inch on the old core beyond the pull down, and being firmly pressed, is drawn along the length of the joint to an equal distance on the other side. The superfluous end is then cut off, the joint is next turned over and the spirit lamp applied so that the heat warms both the joint and the sheeting. The sheeting is pinched round the joint and slightly pulled so as to make adhesion better. The spare sheeting is then cut off with the moistened scissors close to the joint, and a warm tool passed over the seam so as to open it again, when it is again pinched up, thus forcing out any air that may be in it. In pinching up the last time one edge ought to overlap the other slightly, so that the warm tool may properly seal up the seam.

By cutting off the sheet too far from the joint the seam cannot be re-opened, and by cutting off the sheet too close no seam is left, and there is necessarily a vacant space in the vacant covering; this is a frequent fault, and should be avoided. By use of the tool the ends of the coating are made to amalgamate with the old material. The joint is then warmed thoroughly, and kneaded with the thumb and forefinger, care being taken to preserve its shape, and to knead evenly all around. It is then rubbed with the moistened hands.

The stick of compound and the joint are again warmed, and the compound is rolled over the joint from end to end. The joint is again warmed, and the compound is worked and spread over it by means of the tooling iron, in an even and uniform manner. The joint is again manipulated with the fingers, and then heated for the last time and rubbed well with the hand moistened. This rubbing must be done uniformly and equally all round. It tends to solidify the joint, and gives it that highly polished and finished appearance so characteristic of the handiwork of a good jointer. The best thing found for moistening is saliva.

It must be remembered that if the gutta percha is heated till it smokes it is useless, and must be thrown

away. Use nothing for heating with a blaze. Gutta percha once burned cannot be restored. If applied merely by softening with hot water the parts will not unite permanently, and will open.

7.—Pole lightning rods are required to be attached to the first, third, and tenth pole on each side of all cables, in the following manner:

Beneath the butt of each pole appointed to have a lightning rod shall be laid a coil of at least three circles of number eight clean galvanized wire, the same to be extended up a small grooved gutter prepared for it, until it extends one foot above the top of the pole. From this upright wire cross wires reaching to within an inch of each main wire, or the binding wire of the insulator which supports it, shall be attached. These rods to be secured by suitable iron staples as may be necessary.

CHATTERTON'S COMPOUND.

This compound, by means of which the alternate coatings of gutta percha upon a cable conductor are cemented together, is composed of the following ingredients:

Stockholm tar.....	1 part.	} by weight.
Resin	1 "	
Gutta percha.....	3 "	

CONGRATULATIONS.

The President has sent the following telegrams to the Presidents of the Argentine Republic and of Uruguay, in response to their messages of congratulation on the completion of the cables between South America and other countries:

EXECUTIVE MANSION,
WASHINGTON, August 10, 1874. }
TO THE PRESIDENT OF THE ARGENTINE REPUBLIC :
I heartily congratulate your Republic upon the completion of the work which brings the South American nationalities into immediate communication with each other and the balance of the civilized world. It is an important step in the interests of commerce and of good fellowship between nations and peoples.
(Signed) U. S. GRANT.

EXECUTIVE MANSION,
WASHINGTON, August 10, 1874. }
TO THE PRESIDENT OF URUGUAY :
I send the warmest congratulations on the completion of the telegraphic line that connects your country with, not only the United States of North America, but most of the civilized nations of the world. May this new means of communication cement the present cordial friendship into the most permanent form.
(Signed) U. S. GRANT.

THE MAGNETIC METALS.

It is well known that, besides iron, there are a few other metals possessing magnetic properties, namely, nickel and cobalt in a strong degree, manganese and chromium in a feebler one. Mr. W. F. Barrett, in an article in the *Philosophical Magazine*, has pointed out the similarity of these metals to each other in their physical and chemical properties.

Thus, as to specific gravity, that of the thirty-eight known metals ranges from lithium, 0.50, to platinum, 21.5, a difference of nearly 21; whereas those of the three strongly magnetic ones are iron, 7.8, nickel, 8.3, cobalt, 8.5, where the extreme difference is only 0.7. Their specific heat is nearly identical; their atomic one is the same; so also their conductivity for sound, heat, and electricity. Their dilation by caloric, and the amount they lengthen by mechanical strain are also identical. The enormous cohesive power of iron, nickel, and cobalt, in the solid state, signalizes these substances as the most tenacious of metals, and their melting point is only exceeded by the platinum group of metals. They are not volatile at the temperature of the hottest furnace, but only by the electric spark, when they yield very similar spectra. As to their chemi-

cal properties, the combining weight of iron is 56 0, nickel, 58 5, and cobalt the same. Chemists class these three metals in the same group, from the similarity of their chemical behavior, and also the identity of their combining energy or atomicity.

What has been said concerning the likeness of iron, nickel, and cobalt, in many respects holds true of manganese and chromium. The former has latterly been used to replace nickel in the alloy of German silver. The compounds of all these five metals are conspicuous for the brilliancy of their colors. This uniform coincidence suggests the practical inference that nickel and cobalt might be obtained in a malleable and ductile condition when submitted to a process similar to that by which wrought iron is produced.

ON THE USE OF PHENIC ACID FOR THE PREPARATION OF WOODS—By *MM. Boucherie*.—It is admitted that if tar increases the durability of woods exposed to air and moisture, this property is owing to its phenic acid and its creosote. It is, then, rational to believe that in replacing the sap of the trees with slightly phenic water they are protected from rot. To test it I impregnated, in the month of August, 1868, some woods with solutions of phenic acid; $\frac{1}{4}$, 1, and 2 in 100 parts. These woods, placed in ground of rich mould, were withdrawn in May, 1874, with a result far from good. I have not used the phenic acid above 2 in 100 parts on account of its insolubility in water. Probably if the wood were impregnated with a solution of 8 to 10 parts for every 100 we should obtain satisfactory results: but how can it be done? The dissolvents of phenic acid are all very costly, and consequently useless for practice. Besides, this acid does not exercise any appreciable action on the tissue of the wood; it simply acts on the albumenoid matters which the vessels enclose, whilst sulphate of copper combines so well with the cellulose that washing with pure water will never expel it. Phenic acid, on the contrary, is insensibly drawn from the wood under the influence of water. *M. Boucherie* considers that phenic acid can only be rendered useful by mixture with sulphate of copper to defend stakes driven into the sea against the attacks of the teredo.

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Are offering 20 per cent. Discount from list prices on all Instruments of their manufacture. The quality of the Instruments will be strictly maintained.

TO ELECTRICIANS AND INVENTORS.

OFFICE OF THE UNION ELECTRO-MOTOR CO.,
63 BROADWAY, NEW YORK, July 8, 1874.

The attention of Electricians and Inventors is invited to the following proposition: The

UNION ELECTRO-MOTOR COMPANY

desire to procure a

GALVANIC BATTERY

fulfilling the following requirements:

1. It must be capable of maintaining a steady current of 6 farads per second through a resistance, external to the battery, of two-tenths of an ohm, with not more than six pairs of plates. This is, approximately, equal to the current developed by 8 of Chester's No. 2 carbon cells, charged with mixed nitric and sulphuric acid in the porous cells through 50 feet of No. 18 copper wire, .049 inches in diameter.
2. It must be absolutely free from fumes, and from liability to leak or spill its contents under any ordinary circumstances. If possible, it is desirable that a battery should be provided to work without liquids—in other words, a dry battery.
3. It must be capable of standing for a considerable length of time unused without material depreciation, and yet be ready to give out its full power at a moment's notice whenever required.
4. It must be self-supplying to an extent which will render it capable of furnishing a current, as above stated, for not less than 800 hours in succession without renewal.
5. Other things being equal, preference will be given to the battery occupying the smallest space.

For the best battery fulfilling the requirements herein specified a premium of

FIVE HUNDRED DOLLARS

will be paid, in accordance with the decision of the judges, if the battery is adopted by the company—which shall also have the privilege of exclusive ownership by paying the additional sum of

FIFTEEN HUNDRED DOLLARS.

This offer will remain open until November 1, 1874.

Judges.—MARSHALL LEFFERTS, President of the Gold and Stock Telegraph Company; GEORGE B. PRESCOTT, Electrician of the Western Union Telegraph Company, and FRANK L. POPE, Electrician.

E. B. GRANT, President.

H. H. DUNCKLEE, Secretary.

Red Star Line.

Appointed to carry the Belgian and United States Mails.

The following Steamers are appointed to sail
FOR ANTWERP.

From Philadelphia.	From New York.
NEDERLAND, Aug. 29.	SWITZERLAND, Aug. 18.
VADERLAND, Sept. 23.	COLINA, Sept. 11.

FROM ANTWERP.

For Philadelphia.	For New York.
VADERLAND, Aug. 30.	COLINA, Aug. 18.
NEDERLAND, Sept. 23.	SWITZERLAND, Sept. 11.

PRICES OF PASSAGE IN CURRENCY.

First Cabin, \$90. Second Cabin, \$80. Steerage and Intermediate tickets to and from all points at the lowest rates. Passenger accommodations for all classes unsurpassed. Ample attendance is provided. Every steamer carries a surgeon and stewards.

Through tickets and through Bills of Lading issued between all prominent points.

For passage, rates of freight, and other information, apply to GEO. W. COLTON, Agent, 42 Broad Street, N. Y. JOHN McDONALD, Passenger Agent, 8 Battery Place, N. Y.

PETER WRIGHT & SONS, Gen'l Ag'ts.

307 Walnut Street, Philadelphia. B. vonder Becke, General European Agent, Antwerp.

AMERICAN LINE.

The American Steamship Company of Philadelphia.

Weekly Mail Steamship service between

PHILADELPHIA AND LIVERPOOL,

CALLING AT QUEENSTOWN,

Sailing every Thursday from Philadelphia, and Sailing every Wednesday from Liverpool.

The following Steamers are appointed to sail from Philadelphia.

ILLINOIS, Aug. 20.	INDIANA, Sept. 10.
OHIO, Aug. 27.	*ABBOTSFORD, Sept. 17.
*KENILWORTH, Sept. 3.	PENNSYLVANIA, Sept. 24.

PRICES OF PASSAGE IN CURRENCY.

Cabin \$75 to \$100 according to accommodations. Steerage and Intermediate tickets to and from all points at the lowest rates.

Steamers marked with a STAR do not carry intermediate. Passenger accommodations for all classes unsurpassed. Ample attendance is provided. Every Steamer carries a surgeon and stewards.

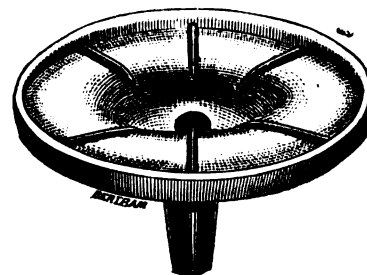
These Steamers are supplied with Life-Rafts in addition to the usual Life-Boats and Life-Preservers. Through tickets and through Bills of Lading issued between all prominent points.

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OVER 4,000 FURNISHED THE WESTERN UNION TELEGRAPH COMPANY UP TO THIS TIME.

The Montreal Telegraph Company have adopted them, and have 2,500 now in use in their principal offices.

THEY THOROUGHLY INSULATE THE BATTERY,
and save more than their cost.

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Liberal reduction for large quantities.

A VERY SUPERIOR SCREW GLASS INSULATOR CHEAP.

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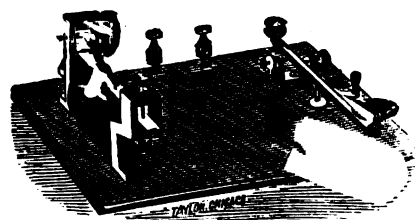
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With this Instrument is furnished

A Complete Outfit for the Student,

INCLUDING

**BATTERY,
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There are several thousand in use.

PRICES:

Complete Outfit	\$7 00
Sounder and Key	6 00
" " with Out-Out and Lightning Arrestor	7 00
Sounder No. 3	4 00
" No. 4	3 00
Key No. 4	4 00

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JOURNAL OF THE TELEGRAPH.

VOL. VII. NO. 17.

NEW YORK, SEPTEMBER 1, 1874.

WHOLE NO. 164.

METHOD OF TESTING INSULATED WIRES FOR A FAULT.

The following method of testing insulated wires for a fault is taken from the *Submarine Report*, a report of the joint committee appointed by the British Government and the Atlantic Telegraph Company, to enquire into the construction of submarine telegraph cables. The arrangements for testing were as follows, the wire having been kept in a perfectly dry temperature for a few days, to avoid surface conduction :

The wire was placed in a coiled form on an insulated horizontal drum *B*, and one end thereof was attached to the stem of the electrometer *A*, in connection with the battery, (512 cells,) the end of the battery wire being covered with dry silk, so as to maintain a constant but subdued charge or tension. A small earthenware basin *C*, filled with water, (having connection with the earth through a galvanometer *H*), was placed in an intermediate position between the drum *B* and the insulated drum *D*. The wire was then gradually drawn through the water in the basin *C*, and wound upon the drum *D*. A few feet were passed through without any effect upon the instrument ; but when a joint made in it on 22d June, became immersed, the needle fell instantly to zero, indicating a defect. The remainder of the

wire, in passing through the testing basin, showed a tolerably uniform state of insulation, only causing a few slight oscillations of the needle.

The wire was then taken from the drum and replaced in a large earthenware pan, with the exception of the defective joint, one end being, as before, attached to the electrometer, and the other insulated, and an earth wire led into the pan. Water was then gradually poured into the large pan at a temperature of 64°, but the needle showed no variation in the insulation. Upon being tested in the ordinary way, the following were the results :

Time.	Temperature of Water.	Temperature of Room.	Full Tension.	Loss of Insulation.
2 P. M.	64	66	50	8 in 27 s.
2 P. M.	64	66	50	8 in 28 s.
2 P. M.	64	66	50	8 in 28 s.
2 P. M.	64	66	50	8 in 30 s.

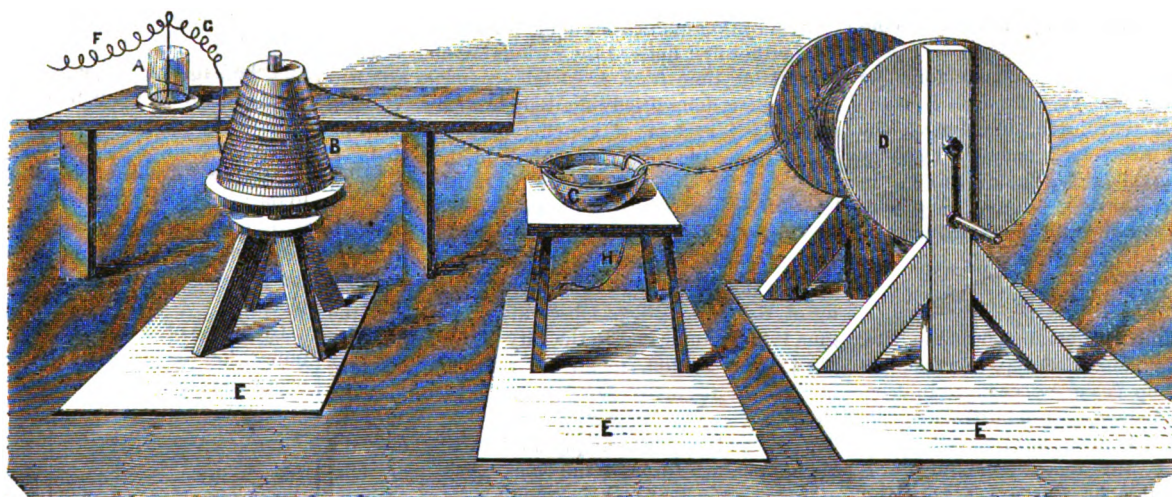
The defective joint being now immersed, the needle fell to zero instantly.

The wire, before being submitted to pressure on the 24th May, tested as follows, viz :—

Time.	Temperature of Water.	Full Tension.	Loss of Insulation.
May 24, 12 P. M.	55	54	8 in 1 m.
June 1, 10:17 P. M.	54.5	54	8 in 1½ m.

The temperature of the water in the pan having been reduced to 32°·5, the wire was again tested with the following results :—

Time.	Temperature of Water.	Temperature of Room.	Full Tension.	Loss of Insulation.
7:30 P. M.	32½	68	50	8 in 3 m. 15 s.
"	32½	68	50	8 in 3 m. 20 s.
"	32½	68	50	8 in 3 m. 17 s.
"	32½	68	50	8 in 3 m. 30 s.
Joint immersed				zero in 15 s.



The following directions for performing this test are given by Mr. Latimer Clark, (Clark and Sabine's "Electrical Tables and Formulæ"). Mr. Warren, in the *Philosophical Magazine*, June, 1874, gives the more recent methods of employing this test.

"The coil of wire is wound on two separate drums, both insulated, and an electrometer connected to each. A powerful battery is connected to one end of the conductor, the induction and leakage through the dielectric causing each of the electrometers to become deflected. Both drums are now discharged by touching them with the hand, and the electrometers fall to zero. The drum which has a defect on it, however, soon acquires its tension again, and its electrometer is deflected, the other remaining unaffected. More wire is then unwound till the fault appears on the other drum. The outside of the wire between the drums must be wiped very dry; the other parts should be moist."

This method of performing the test was soon abandoned, from its being cumbersome and badly adapted for locating very minute faults, as by the use of two electrometers with different degrees of

sensitiveness it was impossible—unless by carefully comparing them—to say on which drum the fault was. Although a galvanometer can be used for the test, an electrometer was preferred, from the fact that the deflected position of the needle or indicator is independent of the length under test, which, by the implied condition of the test, is variable. Obviously with a galvanometer the deflections alone could be but little depended upon.

The electrometers first used were a modified form of Coulomb's torsion instrument by Mr. Latimer Clark, which was replaced by a more sensitive arrangement of Peltier's electrometer which I had constructed. This in turn gave way to Sir William Thomson's quadrant electrometer, which, under skilful manipulation, is the most certain and convenient instrument, especially for demonstration, as a few yards of core will suffice for the experiment. In practice an ordinary reflecting astatic galvanometer is generally used, in which case, instead of being guided by the deflections, we note the rush of

current into the core when each drum alternately is connected to earth after a few moments previous insulation.

I will first describe the method employed when an electrometer is used. The length of wire to be operated on is immaterial, provided that the whole or a portion of it can be coiled on an insulated

drum, and that between the parts coiled the surface of the core—for a length of 6 or 8 inches—can be cleaned and dried so as to prevent conduction.

In the first case (when the whole can be coiled on a drum), one-half is coiled off on a second drum, and the two drums *A* and *B* afterwards carefully insulated. The 6 or 8 inches surface of the core, which call *C D*, between the drums above referred to is well cleaned and dried. The conductor is attached to an electrometer, and the two drums are connected to earth by an attendant at each drum, when by connecting the battery to the electrometer and core the whole will become charged; the battery is then disconnected from the electrometer, and the earth-wires simultaneously taken off the drums. It is best to leave the battery on until the earth-wires are removed from the drums.

The insulation of the drums *A* and *B* and the electrometer should be such that no loss can be perceived after a few minutes, when, if the earth-wire be applied first to one drum and then to the other, the fault will be found on that drum which causes the greatest fall in the electrometer. The wire is

coiled from the faulty side to the other, and the test repeated as often as is required. A mile of core with a small fault in it can, by a little practice, be put right in an hour or two, involving no more waste than the insulator, which can be held between the fingers, and without even cutting the conductor.

It is obvious if C D represent a joint it may be tested by this method with great ease. In fact, so delicate is this test when used for joints in this way, that if A and B each be 2 or 3 miles in length, and C D—a length of 10 inches—be slightly heated above the portions on A and B, the difference in insulation will be readily perceptible on the electrometer when this portion is connected to earth. The limits to the delicacy of the test are only reached when A and B are absolutely insulated.

In the second case, where the bulk would prevent the whole from being insulated, we should continue to coil the core upon an insulated drum until the fault disappeared—that is, until it was coiled on the drum. This is a useful method when dealing with “served core” at a cable factory.

When a galvanometer is used the corrections are as for ordinary insulation-tests. The galvanometer is short-circuited; and A and B, whilst connected to earth, are charged as before. The earth-wires are removed, and the short-circuit key opened. The drums are, after a few moments, connected to earth alternately, when the loss of charge is soon rendered visible on both sides; but as the lengths on A and B may be very unequal, the rush of current alone will not enable us to say on which side the fault may be; but by carefully watching the electrification for an equal time on each side, no difficulty will be found in fixing upon the drum containing the fault.

Two or more faults existing together form no embarrassment to the test. All to be done is, if the faults are of unequal magnitude, to remove the more extensive first, or to keep one side right by removing the faults as they are coiled over to it. In any case the battery power required will vary with the magnitude of the fault and the sensitiveness of the instrument.

CABLE SOUNDINGS IN THE PACIFIC.

A special despatch from Washington to the *Boston Globe* says: Captain Belknap, commander United States steamship *Tuscarora*, engaged in deep-sea soundings in the Pacific, in a report, dated Hakodadi, Japan, June 26, gives an interesting and valuable account of the recent soundings. It will be remembered that he first ran a course of soundings from Puget Sound to San Diego, thence to Yokohama via Sandwich Islands. It was his intention to return on the line of the great circle, passing through the Island of Sanoga, of the Aleutian group and towards Puget Sound. He left Yokohama on his return voyage, July 8, at daylight, and the next morning began sounding homeward. When about 100 miles East by South of King Kasan, or Sendai Bay, on the East Coast of Japan, the lead sunk to a depth of 3,427 fathoms, showing a descent of 1,594 fathoms in a run of thirty miles. The result seemed extraordinary, especially in view of the short distance from land; but the next coast revealed a depth still more astonishing, the sinker carrying the wire down 4,643 fathoms without reaching bottom. On this occasion, when some 200 fathoms of wire had run out, the sinker was suddenly swept under the ship's bottom by a strong under-current, and all efforts to get the wire clear and to keep it from tending underneath were unavailing, the difficulty being increased by a fresh breeze and a moderately heavy sea.

Finally, when 4,643 fathoms of wire had run out, and only about 150 fathoms were left on the reel, it broke close to the surface and about five miles were lost. After this experience, Commander Belknap concluded that the currents of the Japan stream proved too strong for a bight of six or seven miles of telegraphic cable, and perhaps will render the process of laying it impossible. He, therefore, ran back in shore, in order to skirt the stream, and began now the great circle off Point Komato, in latitude 40 degrees North. On this new line he found very deep water. At one cast the sinker reached a depth of 4,655 fathoms, but with slight current. The conditions under which these latter deep casts were made were conveniently favorable. The wind was light and the sea smooth, the swell being remarkably gentle for the Pacific, and the ship was as quiet and steady as though at anchor. The wire ran straight down, and in a moment touched bottom, which was instantly and accurately known at 4,655 fathoms, or more than five miles and a quarter, as at 1,000 or 100 fathoms, the indications of the dynamometer being wonderfully accurate and unmistakably clear in all deep soundings made. On the return trip the wire broke three different times, involving a loss of fifteen miles of wire. The line will be abandoned, as it is impracticable for telegraphic cables, and a new line, close to the Northern shore, will be taken up, and, if found practicable, continued to the American coast.

CLOCK TIME BY TELEGRAPH.

By WM. A. ROGERS, of Cambridge.

This paper was entitled “On the Harvard College System of Communicating Time for Civil Purposes.” The author first noticed the various methods of communicating time from fixed Observatories hitherto in use, describing briefly the Bain system of electric clocks, the system of copying dials invented by Wheatstone, the spring pendulum method of Shepherd, and the Jones system of controlled clocks, in which electricity controls the motion of the pendulum instead of producing the motion as in the Bain system. The speaker proceeded to describe the method introduced by Prof. Joseph Winlock, Director of Harvard College Observatory, by which the time is communicated to the City of Cambridge, to the City of Boston, to all the railroads centering in Boston, to many jewelers and private establishments, and the watch factory at Waltham. The method consists simply in inserting into the circuit passing through the clock an ordinary telegraphic sounder. At every second beat of the pendulum the circuit is broken and a click of the magnet is heard. By a simple device the clock is made to omit every fifty-eighth second. When one, therefore, wishes to ascertain the error of his time-piece, he has only to watch for the omitted break, and the first click thereafter is the exact beginning of a minute as shown by the time clock at the Observatory. At every even five minutes there is an omission of about 25 seconds preceding.

The time clock is kept correct by adding to or removing from the pendulum shot of various sizes. A single bird-shot of average size produces an effect of about 1-10th of a second per day upon the rate, but this correction often requires the exercise of considerable judgment, as it frequently happens that while the addition of one, two, and sometimes even three shot produce no apparent effect, the addition of a fourth produces the effect due to all the shot added. This method possesses this decided advantage, that it can never give the time incorrectly. In the system of controlled clocks, if the current fails the clock may meanwhile gain or lose, and when the current

is restored the error of the clock remains; but in this method, under similar circumstances, one must do what is necessary to be done when one wishes to send a message over a broken line—wait till it is repaired. When the circuit is restored the same instant the time is correctly given.

Prof. G. W. Hough of Albany had a paper relating to the same general subject, entitled “A Method of Transmitting Time Signals over Telegraph Wires,” which he read immediately after Mr. Rogers's paper. Prof. Hough described the method of transmitting time in use at the Dudley Observatory. The time is sent by this method twice in each hour. In the interval the current is not transmitted. The time during which it is thus sent being only ten minutes in each hour, it does not interfere materially or in fact worth naming with the general use of the telegraph wires. The operator who is sending a message merely stops for ten seconds while the time signals are going forward. Prof. Hough considered this method less cumbrous and more efficient than that in use at Harvard Observatory.

THE WIND PUTS ITSELF ON RECORD.

By Professor G. W. HOUGH, of Albany.

This paper was entitled “Description of a new mechanism for printing hourly the Direction and Velocity of the Wind.” At a previous meeting of this Association an apparatus was described for printing the direction and recording the velocity of the wind by the use of two telegraph wires, one for direction and one for velocity. The object of the mechanism now presented is to print both direction and velocity simultaneously at definite intervals.

The apparatus for velocity consists of a movement for giving motion to a set of type wheels, which is unlocked for each tenth of a mile of wind. Four brass type arms, on which are engraved the letters N. S. E. W., are placed on the prolongation of the shaft, carrying the type wheels for velocity; and these arms, by means of connecting rods, are attached to the armatures of four electro-magnets. Telegraph wires communicating with the vane shaft and magnets cause one or more of the letters to be elevated for printing whenever the battery current is completed.

By means of a half second pendulum clock, an impression for direction and velocity is made hourly on a slip of paper two inches wide and eight inches in length, as follows:

Time.	Direction.	Velocity.	The first column is the time, the second direction, and the third velocity in miles.
0	N. E.	342	
1	N.	360	
2	N. E.	372	
3	N. E.	385	

So far as Prof. Hough is informed, this is the first and only mechanism for printing the direction and velocity. The total distance traveled by the wind in a day, month or year is read from the sheet without computation; consequently the device is eminently labor-saving.

EXPERIMENTS ON ELECTRICAL TRANSMISSION THROUGH WOOD.—M. Du Moncel has recently been experimenting on electrical transmission through wood. His results are given in *Compte Rendus* of July 6th. Prisms of various kinds of wood were inserted between two platinum plates, which were in a circuit and could be pressed towards each other. The effect of heating and drying the wood was also studied. M. Du Moncel considers that the relative conductivity of wood is due, in great part, if not wholly, to moisture absorbed through its pores. The effect of pressure was greatly to increase the conductivity, the two surfaces superfused being then brought into closer contact.—*London Chemical News*.

ON THE ENERGY OF ELECTRICITY, WITH ESPECIAL REFERENCE TO THE MEASUREMENT AND UTILIZATION OF IT.

By the Rev. ARTHUR RICE, M.A.

The energy of electricity is being manifested in phases new to men day by day. That which in the early part of the present century was unknown is now so well known as to win neither surprise nor notice. The telegraph which girdles the earth—the electro-deposition of metals—the light which pales our brightest—the power which melts the most refractory metals (for I have seen a square bar of iron a foot in length, and about three-eighths of an inch on the side, fused into drops by a current of electricity in less time than this narrative has occupied)—these have been handed down by science to promote the commercial and social welfare of mankind.

What remains to be done by this energy, so recently harnessed, and as yet only partially trained, is beyond our present ken; but that it will—or, at least, that it can—be developed in a sufficiency to supply our coal-fields when exhausted, and take upon itself all that coal, and wind, and water now give of kinetic energy, no one who has watched the progress of the past need doubt; this, too, quite irrespective of the view that owing to the quantity of zinc consumed electricity can never compete with coal in producing the same results. There is every reason to expect that long ere the coal-fields are exhausted the tidal waves on our coasts will be supplying light enough and heat enough, and, therefore power enough, for the requirements of Great Britain and Ireland.

Propositions better established than that which asserts electricity to be non-producible from sufficiently economical sources have faded into oblivion.

The energies of electricity are manifested whenever there is a molecular disturbance within or amongst bodies. Whenever any change takes place in anything whatever, and amongst any molecules whatever, an electric current is produced, and if not necessarily manifested to us, still it always is present. Probably there is not a single act of our lives, and it may be not even a thought in our heads, which is not associated with an electric current.

Kindly understand that the lecture is on the energy of electricity, and, therefore, time must not be occupied in describing instruments. Galvanometers are now-a-days made so delicate that if you lay one finger in one trough of salt water, and another in another, and simply tighten the muscles of one arm, a current of electricity passes through the galvanometer and deflects the needle. We cannot raise our hands to our head without setting free a current of electricity, and in that current is energy. Its energy is manifested in the moving of the galvanometer needle. How much of that energy is merely the balance between two energies of large amount—how much is not manifested, owing to the sluggishness of the instrument and from other defects, we know not, but that some is thus interfered with there is very little doubt. We usually speak of a galvanic battery as being formed of zinc and copper, or of metals in chemically different relations to a liquid; if, however, you take a piece of ordinary copper bell-wire, and connect the two ends of it to the galvanometer, then cut it in two with a pair of scissors, and dip each cut end into salt and water, or put them into your mouth, an electric current passes, and the galvanometer shows that there has been some species or other of molecular disturbance which has caused a manifestation of electrical energy.

This energy of electricity becomes kinetic when

it is allowed to pass freely. For example, in any bodies which are quiescent, it is kinetic, but it is potential when resisted. If, for instance, a current of electricity passes along a wire and the action is resisted, the wire becomes hot. If it passes through any compound body, as, for instance, water, then it is resisted, and the water is immediately decomposed. Consequently we are dealing with an energy manifested in molecular disturbance, and having both a potential or stored-up power, and a kinetic power in motion. The question now is, how is this energy to be measured? for the subject of the lecture is a mode of measuring the energy of electricity.

Towards the middle of the last century (about 1746) the first electrical machine was made. In 1850, Otto Guericke, to whom we are indebted for the air-pump, suggested the scheme, but Hawksbee was the first to make one. His machine consisted of a ball of sulphur, afterwards altered to a ball of glass. The hands were employed to rub it, and a large fly-wheel, about 6 feet high, was employed to turn it. Silk threads from the ceiling held what we now call the conductor; and by the exercise of a very large amount of mechanical power they were enabled to get a small spark, to the surprise of all, to the curiosity of many, and the dread of not a few. After that we come to the plate machine, which is arranged, as you are aware, with cushions; still we have those sparks which were supposed to have much energy in them. We then pass on from the glass plate machine to the vulcanite plate machine. Here is a vulcanite plate, and, as you are aware, by rotating it between cushions, the electricity is gathered upon this conductor. You see this large wooden ring—that was suggested by Winter; the object of it was, somehow or other, we do not know how, to condense the electricity, and to convert what might be a fine line spark into a solid whitish spark. How this ring acts, and the whole history of this machine, would be quite sufficient matter for one lecture; but that with which we are now concerned is not how to produce such phenomena, but how to attempt to measure the energy of the electricity which these machines, and other means, can develop. I scarcely need tell you that it is not, in any sense of the word, an electrical lecture in which we are to be engaged, and these apparatus are only here as illustrations of the operations. Sparks pass from the conductor, and are usually charged into a jar of this kind—a Leyden jar. That was first done in the year 1746. The jars were charged and discharged, and although great shocks were felt, yet no measure was taken, and it was supposed that in the shock consisted the energy of electricity.

Now, the mode in which electricity thus presenting itself was ultimately measured by a small jar of this kind, called a unit jar. This unit jar is in all respects the counterpart of the Leyden jar, only made smaller, and one is here mounted on glass and brass rods. There are two brass balls, one connected with the inside of the jar and one with the outside, which balls can be set at any distance apart. The inside of the jar is charged from the electrical machine, and as soon as it is sufficiently charged, according to the distance of the balls from one another, a spark passes. So passing, spark after spark enters the larger jar, and if we count the number of such entering, we have settled what was supposed to be the measure of energy contained in the large jar. We may put in 10, 20, 30, or 40 charges. It will be very obvious to you, however, that these unit jars vary. The same jar is always alike, but you cannot make two exactly alike. Even if this could be done, the state of the atmos-

phere and other surroundings would so influence the passing electricity that accurate comparisons and conclusions could not be made. Moreover, these jars vary on the surface, and in the character of the glass, and in other ways; consequently this mode of measuring energy must necessarily be a failure. The unit jar, therefore, has fallen into complete disuse.

Hitherto the mode of producing the electricity to be measured has been by friction. Now, here is a machine, consisting of a thin circular vulcanite disc, capable of being put in rapid rotation, but there are no rubbers or other articles in contact with the plate. It is called a Bertech machine. Here are three segments of thin vulcanite; one of these is rubbed with a piece of dry silk or fur, and, being slid in prepared grooves, the faces of the segment and rotating vulcanite are about one-quarter of an inch apart. These two other segmental pieces can be slid behind the first one; if the room and the atmosphere were not so damp we should probably get a 4-inch spark from this machine. One segment is rubbed, and placed about a quarter of an inch from the disc, and by a process of induction, when it is rotated, there is a noise as of much electricity being brought forward and gathered by the conductor.

There is another matter, also peculiar to electricity of this character, compared with the uses to which iron is now applied. Here is a small glass flask with crumpled pieces of tin-foil in it. If this flask were coated on the outside, as a jar is, the amount of intensity and the shock that would be given by it, would be equal to what might be obtained from that large jar, for this reason: the electrical balances between the inner superficial metal surface and the outer coating of the jar depend upon the intensity on these two. Electricity of this character rests upon surfaces only; electricity of that other character, with which we are more concerned, enters below the surface, and may be said to reside and travel within the body. Whatever, therefore, may be the number of, say, square inches of surface within the jar, the electricity upon the whole of them would be balanced by electricity of equal intensity upon an outer surface covering the jar only. This may be illustrated by a reference to the large quantity of water contained in a dock for ships. It is supported or kept at its level by a gate which in no respect is stronger than would be required for a dock of the same depth containing not one-tenth of the quantity of water. So with what is called the hydrostatic paradox, also with Bramah's hydraulic press, and so with this little jar.

The electricity here has been produced through physical exertion. We found, however, that there is no physical exertion so great as that which takes place between the molecules of different bodies when chemical affinity is allowed to operate. If, therefore, instead of getting molecular disturbance in the muscles of our arms by turning these handles, we produce molecular disturbance between the ultimate atoms, or molecules of matter, forces are called into play as far beyond the power of our arms as those of the most colossal steam-engine are beyond the power of a mouse. By chemical arrangements we are enabled to obtain electricity of a totally different character from that hitherto noticed—so different that there is little similarity between them, excepting a common name. In fact, the earlier attempts at telegraphy failed in consequence of the promoters using electricity produced by machinery such as this—an electricity which is possessed only of intensity, and not of that energy consequent upon quantity.—*London Chemical News.*

CORRESPONDENCE.

CLEVELAND, August 18, 1874.

To the Editor of the Journal of the Telegraph:

Careful observation has proven to my mind that fully nine-tenths of the mistakes made in transmitting messages, can be traced to the sending operator. It is conceded that the receiving operator, as a rule, is more watchful as to the correctness of his business, than the sender. It requires more judgment to send a message, especially a poorly written one, than to receive it. The receiving operator in such cases is entirely at the mercy of the sender. I wish to speak more particularly about the checks. The words Paid and Collect are so entirely different, that an operator, with an ordinary amount of care, will scarcely ever get these words wrong, and as both words are now fully written out, it seems to me almost impossible to receive them incorrectly. Two cases have occurred in this office this week. Message going to a party whose messages are most invariably Collect. Sending operator sent it Paid. Receiving operator, knowing these messages went Collect, enquired if it should not be Collect. Sending operator told him to make it Collect—that it was his mistake. Another, of a message coming from an opposition line to a manager of a W. U. office, was checked, collect one tariff. Receiving operator, supposing it was D. H. on W. U. line, said nothing. When this message reached its destination, the manager enquired if it should be D. H. on W. U., or opposition line, as both tariffs were the same. He was informed that it should have been sent collect for both lines, but one tariff was omitted by the sender. Receivers come in for these little trifles right along, but its unjust in most cases.

FAIR PLAY.

BALTIMORE, July 22, 1874.

To the Editor of the Journal of the Telegraph:

Please answer what I must do in following case. A gentleman brings a message to office as follows:

"Mrs. S. B.,

Long Branch, N. J.

Is Mrs. S. with you? Answer to Sam.

(Signed)

J. W. B."

He refuses to give any address for reply, or his own address, and also refuses to prepay answer. Shall I decline message unless answer is prepaid, or send office message notifying receiving office not to take answer unless prepaid. Please answer through the JOURNAL.

RECEIVER.

Answer.—The message requests the answer to be given to another party, and, of course, would require prepayment as an original message. You evidently misunderstood the case. J. W. B. does not ask an answer.

FRANKLIN, LA., Aug. 6th, 1874.

To the Editor of the Journal of the Telegraph:

Sec. 3764 of the Revised Statutes of Louisiana, reads as follows: "No operator or agent of any telegraph shall be permitted to transmit any message which can in any way tend to defeat the ends of justice, by preventing the apprehension of fugitives from justice, or by communicating such information as may enable persons charged with offenses to escape. Any person so offending shall be imprisoned not less than twelve months nor more than two years, at hard labor, and fined not less than two hundred and fifty dollars nor more than five hundred dollars."

Now, for instance, a warrant has been issued for the arrest of one Jno. Smith, living in the town of

B. A friend or relative hands in a telegram for transmission, informing him of the fact, and advising him to hide himself. Should I refuse the message upon the ground that it is calculated to defeat the ends of justice? Please answer through the JOURNAL (for the benefit of all), the proper course to pursue in such a case.

ATTAKAPUS.

Answer.—1. The law must be obeyed. If a message is offered to a telegraph office telling a culprit to "hide himself," as stated, and the person addressed is a culprit, and known as such, the message must be refused.

2. But the case must be clear. Telegraph offices cannot be expected to keep a rogue's gallery, or a criminal directory, or hold court over the language of messages, and adjudicate on them as smelling of, or aiding crime. The law would seem to place an operator in that very impossible position. A thousand messages can be framed tending to evade justice, which even with ordinary knowledge of current crime, could only be dimly suspected of such design. It is a question in which an intelligent man must judge of his duty, and the facts which justify the refusal of a message should be so positive as to secure that the refusal do not become itself a cause of complaint.

To the Editor of the Journal of the Telegraph:

Parties often come into this office and request a word to be repeated, and sometimes an entire message. It happens in a great majority of cases, that the word or message is received as the party wrote it. Now should not the party making the request pay for it at full rates, and also for the repetition. In case this process reveals an error on part of company, the charges on both messages could be refunded. If, however, no mistake has been made by company, don't you think the charges for such services should be collected.

MOBILE OFFICE.

Answer.—The parties desiring such services from the company, should be required to pay for it. Should it transpire that an error had been made by the telegraph, the tolls for the extra service may be refunded, and the vouchers therefor be returned with the monthly account, accompanied by proper explanations. Read Rule 97.

To the Editor of the Journal of the Telegraph:

Should an office, in notifying another that a message cannot be delivered, be obliged to state reason therefor.

G. P. WILLIAMS, Sup't.

Answer.—If obliged to make an answer to be applicable to all cases, we should say no, but there are, undoubtedly, instances in which some explanation should be made, and the matter must therefore be left largely to the discretion of managers, who should, however, be extremely careful in permitting the wires to be used without pay, to correct the results of the carelessness or penuriousness of customers.

WILLIAMSTOWN, MASS., July 31st., 1874.

To the Editor of the Journal of the Telegraph:

Please inform me through the JOURNAL, if, when a person receives a D. H. message requiring an answer, the answer goes D. H.? For instance, a gentleman receives a D. H. message requiring an answer. The gentleman wishing to answer tells me to send it D. H. I tell him I cannot do it unless he has a D. H. stamp. Wherewith he says, send it collect. In making out the check, I say "10 collect, 'tis answer." My repeating office wishes to know why I don't make the check "10 D. H., 'tis answer D. H." Which is correct?

J. G. S.

Answer.—An answer to a free message is free also.*To the Editor of the Journal of the Telegraph:*

No. 9 is our business wire, but it being often full, I sometimes go on 7 or 8 and call repeating offices. One repeating station refuses to take from me on any wire but 9, saying, "that is your wire and keep on it;" thus delaying business for an hour or more. Has repeating office authority to refuse business on any wire? Please answer through JOURNAL and oblige,

X. Z.

Answer.—One office should not refuse to receive business from another no matter upon which wire it might be offered. At the same time, the sending office should be careful to observe that its regular wire is occupied before going upon another, and that the latter is idle. Technicalities must not be allowed to cause delay to business. Rule 20 covers this case.

To the Editor of the Journal of the Telegraph:

How many words in following message:

"Hattie Smith,

New York.

Have mailed letter containing post-office order; am quite well; home soon.

[Signed.]

JOHN."

Receiving office says 12 words, I say 11, he counting post-office 2, I 1. Please answer through JOURNAL.

X.

Answer.—Webster connects the words "post" and "office" with a hyphen. Consequently they are to be counted as one word.

THE art of printing, according to Du Halde and the missionaries, was practised in China nearly fifty years before the Christian era.

ASTRONOMY was first studied by the Moors, and was introduced by them into Europe in 1201. The rapid progress of modern astronomy dates from the time of Copernicus. Books of astronomy and geometry were destroyed, as infected with magic, in England, under the reign of Edward VI., in 1552.

PHENOMENA OF STATIC INDUCTION PRODUCED BY MEANS OF RUHMKORFF'S COIL.—*M. E. Bichat.*—The author finds that if the current of a battery, 'alternately interrupted and re-established, is made to pass through the thick wire of a Ruhmkorff's coil, two induced currents in contrary directions appear in the fine wire, and for a certain explosible distance there seems to be only one current produced. This current is direct, and the sparks given by it have quite the appearance of sparks of static electricity. Reciprocally, if a series of sparks of static electricity are passed through the fine wire, we receive in the thick wire currents quite analogous to those given by the battery. On examining these currents by means of a voltmeter, there appears to be merely one current in an inverse direction.—*Chemical News.*

ON MAGNETISM.—*J. M. Gauguain.*—In determining the distribution of magnetism by the method of weights supported, we find that friction directed from the arch (of a horse-shoe magnet) towards the poles diminishes the magnetization near the arch, and increases it near the poles. Friction in the opposite direction produces inverse effects. Hence, considering merely the phenomena of attraction, we may, according to the views of M. Jamin, compare magnetism to a heap of sand, of which the figure may be changed whilst the mass remains invariable. The friction exerted by means of a bar of soft iron sweeps the magnetism either towards the arch or towards the poles. It is, however, difficult to see how this conception can apply to the phenomena of induction.—*Chemical News.*

FREAKS OF LIGHTNING.

A late issue of the *Springfield Republican* contains an interesting account of the freaks of lightning, during a severe storm on June 7th, at which time the house of Mr. E. W. B. Canning, at Stockbridge, Mass., was struck and considerably damaged. The writer (Mr. Canning) details some of the phenomena as follows:

"My house is furnished with a rod, which is fastened to the west chimney of its front portion, running through proper insulators down the north side over the tinued roof of an eight feet projection and entering the ground deeply, some thirty feet from the place where the traces of the lightning remain on the outer and inner walls of the building. Several trees—maple and elm—stand near the house, whose tops exceed the highest point of the rod, one of the former being less than ten feet from and directly opposite the place where the unwelcome visitor seems to have made its exit. The bolt appears to have been divided; for that the conducting rod did its duty, in part, at least, is proved by one of the family, who was in the act of closing a window immediately in front and not ten feet from it, and who saw the fluid pour along down it like a stream of molten silver. To the others of the household, who were seated in the library—one of the front rooms—the remainder of the bolt, as it entered the room, resembled two balls of fire, one bursting through the wall and the other rolling along the carpet. The simultaneous flash and crash stunned and blinded them for a few moments, all receiving a shock more or less intense. The room was entirely dark at the time, and it was not until a transient lull in the storm that an investigation revealed the results of the explosion. The apartment was filled with a sulphurous odor, mingled with that of burnt woollen. The western portion of the library is an extension of six feet beneath an arch, and its ceiling is some eighteen inches lower than that of the main room. A double window, reaching to the floor, divides its western wall, on either side of which hangs a picture from hooks attached over a grooved chestnut cornice. Directly over the southernmost of these hooks is an orifice about an inch in length by a quarter in width, pierced by the bolt. Thence to the picture frame the cord was blackened, and several inches of a small copper wire with which it was slightly wound were fused. On the wall near the cord ring on the frame a ragged and irregular hole, as large as an ordinary man's fist, is torn through the plastering, from whose edges, burned *inward*, it might be inferred that there the fluid entered the room. But the lathing beneath is indented *outwardly*, as though it had been struck by a heavy, round-faced hammer. The plastering was thrown, in the finest powder, over even the farthest portions of the room. The closest search has failed to discover where the fluid entered the house *externally*, through wall or roof; but, from the casing outside, under the clap-boards and about five feet below the hole in the library, a splinter, some two feet by three inches, was torn off and thrown twenty feet away, revealing beneath two large nails, whose attraction probably determined its point of departure. Thence it seems to have leaped into the earth on the edge of the terrace, and close to the roots of the nearest maple, scooping out the soil like the path of a cannon ball into a hillside. Clumps of turf were thrown upon the sill of my neighbor's window, more than thirty feet distant.

"But to some of the more peculiar features of the case: On the satin-faced buff paper of the library, and directly under and on both sides of the picture cord, there is portrayed the versimilitude of a vine,

with leaves alternate, dashed with great distinctness, and in color a very dark bronze. Seven or eight leaves are distinguishable, growing smaller and less distinct toward the ceiling. Their shape resembles that of an ivy leaf, a sprig of which was trimmed over the arch, six feet before it, and which was loosened and thrown down by the shock. I am half inclined to consider this a specimen of the photographing process of the electric fluid, occasionally recorded in descriptions of the effects of lightning. The copy is so true as to have deceived me, when I first saw it by lamp light, into asking where that vine came from. Students in physics will recall what I mean; instances of which, though uncommon, are yet by no means unknown, where images of objects immediately in front of the operating fluid are faithfully portrayed upon a neighboring surface. Only yesterday a gentleman gave me an instance in the case of his brother, who was instantly killed by lightning, a week ago, in Virginia. He was sitting near and opposite an open window, and on a hillside in front of it stood a dead tree towering with huge limbs over the humbler vegetation. On preparing the body for burial this tree was found most faithfully copied beneath his clothing upon his breast. The vine before mentioned more nearly corresponds with such facts that anything that has occurred in my own experience hitherto.

"Another curious fact, unnoticed till some days after the occurrence, is this: The ceiling of my library was replastered last May. A queer pock-marked appearance on portions of its originally smooth surface led to a revelation that small pieces had been nicked out all over it. This I attribute to the tinge of iron in the granules of the sand in the mortar (all the sand hereabout is thus affected) attracting the fluid and causing their dislodgement. If this be true, it proves the universal perversion of the subtle agent through the premises.

"The storm during which all this happened was more severe and of longer duration than any remembered by 'the oldest inhabitant.' The dwellers on the heights above the village say that it was the meeting of two highly charged clouds, that were observed to follow each a range of hills on either side of our town, and, coming in contact at the point of the valley, paused and 'fought it out on that line' from eight o'clock Sabbath evening till three next morning, and then, seemingly exhausted, went growling down the Housatonic.

"A singular phenomenon in the vegetable world appeared so directly after that elemental conflict as to warrant the belief of our fruit growers that it is attributable thereto. On many of the fruit trees, particularly the pears, there was, next day, observed a blight, which, without scarring or crisping the leaves, turned them entirely black—in some cases the foliage of solitary twigs, and again that of whole branches.

"During the storm several dwellings in our town were struck with greater damage than my own. A few beasts were killed, and fields, meadows, gardens, and particularly highways, badly washed by the floods that fell. But a more enduring *souvenir* has been left upon the side of Monument mountain in a huge furrow, which, as seen from the village, suggests a giant's grave scooped in the dense forest during that night of terror. I am informed that it is some thirty rods long by two or three wide, and looks like the path of an immense shell along the earth, tearing up trees, rocks and soil, and throwing them into a chaos of debris on every side. It is not a gully occasioned by a water-course, but bears rather the marks of a tremendous thunderbolt ploughing its furrow along the ground."

THE DUPLEX SYSTEM ON LONG SUBMARINE CABLES.

The JOURNAL of August 1st, contained a letter from Mr. C. V. De Sauty, copied from the *Telegraphic Journal*, in which Mr. De Sauty claimed to have succeeded, after experimenting fourteen months, in successfully applying the duplex system to the working of long submarine cables. In the number of *The Telegraphic Journal* for August 1st, Mr. B. Smith, of the Eastern Telegraph Company, under date of Malta, July 10th, contests the impression conveyed by Mr. De Sauty's letter of priority in successfully applying the duplex to such cables. He says:

"Mr. De Sauty is to be congratulated on his success after so long a period as fourteen months of experiment. Permit me, however, to point out that Mr. De Sauty's is not the first solution of the problem of submarine 'duplex' telegraphy, as applied to long cables, as would seem to be claimed by his letter.

On my arrival at this station in June, of last year, I found Mr. De Sauty here experimenting on the matter. The instruments used at both ends were Thomson's 'recorders,' and Mr. De Sauty found, on charging and discharging the line, that a sudden jerk of the syphon took place at the home end, which he called the 'kick.' All his attempts to neutralize this having failed, on the 6th of July he returned to Gibraltar, expressing his fear that this difficulty would prove fatal to the success of the system.

After Mr. De Sauty's departure I selected one of the Company's Alexandria cables on which to experiment, as, having duplicate cables, the traffic would be less interfered with than had the Gibraltar cable been chosen.

Foreseeing that the first object to which attention should be directed was the 'kick,' my experiments were made with a view to ascertaining its cause and the means of removing it. This difficulty being overcome, I anticipated no obstacle to the practical application of the system to the company's lines. I eventually succeeded in readily producing or nullifying it at pleasure, and on the 22d July, 1873, I had the pleasure of informing our London Head Office that I had succeeded in working the 'duplex' system between our Malta and Alexandria stations—a distance of 911 nautical miles. As a test of the arrangement, the cable was kept connected up for the 'duplex' during the whole of the 21st of that month, for a considerable portion of which time the traffic was passing on the 'duplex' system.

Of course success on such a length of cable rendered success on any other line of approximately similar length—such as the Gibraltar-Malta cable—a mere matter of adjustment; but, in order to satisfy myself, I, at the commencement of September, transferred my arrangements to the Gibraltar cable, and had the satisfaction of reporting, on the 3d of September, that signals, as nearly perfect as possible, had been transmitted between here and Gibraltar on this system.

Nothing but lack of sufficient apparatus has prevented the system being established on the company's lines for months past.

As my experiments were made in the Eastern Telegraph Company's interests, solely at their expense, and with their cables and apparatus, I did not consider myself at liberty to make public, through your *Journal*, the means by which I had attained success; but I may incidentally mention that a full account, with a drawing of the *modus operandi*, was sent to Mr. De Sauty at the time.

TARIFF BUREAU.

SEMI-MONTHLY CIRCULAR.

EXECUTIVE OFFICE,
WESTERN UNION TELEGRAPH COMPANY,
145 BROADWAY, NEW YORK,
September 1, 1874.

To all Offices on W. U. Lines:

The following changes and additions have been made since the date of the last circular:

GENERAL INFORMATION.

Offices which have a State rate to Michigan of \$2.00, will hereafter charge \$2.50 to squares 19, 34, 43 and 49.

Hereafter the "tariff for other lines" from Meridian, Miss., to points named on other lines in Alabama and Georgia, will be as follows:

Atalla, Ala.,	55 4	Morgansville, Ga.,	75 5
Carthage, Ala.,	40 3	Springville, Ala.,	50 3
Collinsville, Ala.,	55 4	Trenton, Ga.,	75 5
Eutaw, "	40 3	Valley Head, Ala.,	65 4

Pensacola, Fla., is now a W. U. office. Check direct. The tariff to Pensacola from offices having a State rate to Florida will be the State rate. All others will charge 35 cents more than their rate to Pollard, Ala.

Black Rock, Idaho, closed.

The P. O. A. of Buckley, Ill., is Buckley.

The office 386 Rutland, Ill., is in La Salle Co.

Kingsville, Ks., re-opened.

Changes in the "tariff for other lines" from Brownsville, Tex., to a number of Mexican offices have been made. They are as follows:

Acatzingo,	500 43	Paso de Ovejas,	535 44
Apizaco,	450 41	San Andres Chalchico-	
Canada,	500 43	mula,	500 43
Cordova,	525 44	San Martin Texmelu-	
Huamantla,	450 41	can,	450 41
Jalapa,	525 44	Soledad,	525 44
Maravatio,	475 43	Toluca,	425 41
Orizava,	525 44	Tepatitan,	450 42
Pachuca,	450 41	Tlaxcala,	450 41
Perote,	509 43	Vera Cruz,	525 44
Puebla,	450 41	Zapotlanejo,	535 41

Leslie, Mich., re-opened.

Mayfield, Mich., closed.

No. Adams, Mich., re-opened, square 231.

Leban n, N. J., closed.

Guyard, N. Y., is now a W. U. office, square 46, ck. direct.

Fairpoint, N. Y., closed.

Princeton, N. C., closed.

180 Dennison, Summit Co., O., closed.

Stouffville, Ont. and Pakenham, Ont., will hereafter be known as Stouffville Sta. and Pakenham Sta.

Buena Vista, Pa., closed.

Gillett's, Pa., is now a W. U. office, square 93, check direct.

Roaring Branch, Pa., re-opened, square 93.

Clarendou Centre, Que., changed to Shawville.

Batesville, S. C., changed to Batesburg.

Hereafter the "tariff for other lines" from Meridian, Miss., to Wauhatchie, Tenn., will be 75 and 5.

Gallatin, Tenn., closed.

Idlewild, Tenn., closed.

Medina, Tenn., closed.

Brazos, Santiago, Texas, re-opened, "tariff for other lines" 50 and 5 from Brownsville.

Speakesville, Texas, closed.

Tehuacana, Texas, changed to Wortham.

Sewall's Point, Va., closed.

NEW OFFICES.

* Irondale, Ala., 45 3 342 Meridian, Miss.

* Lakeport, Cal., 60 130 Colusa.

Saucelito, Cal.

* Upper Lake, Cal., 60 130 Colusa.

† For each additional five or fraction of five words.

557 Boulder City, Col.

237 Milner, Ga.

* Rising Fawn, Ga., 75 5 342 Meridian, Miss.

578 Ross Fork, Idaho.

386 Hennepin, Ill.

336 Lottant, Ill.

307 St. Charles, Ill.

283 Rocky Hill, Ky.

* Bethel Mills, Me., 25 1 14 Portland, Mont. Co.

* Ameca Ameca, Mexico, 425 40 589 Brownsville, Tex.

* Coatepec, " 525 44 589 "

* Copala, " 575 52 589 "

* Concordia, " 575 50 589 "

* Cuitzco, " 350 31 589 "

* Chalco,	Mexico,	425 40 589	Brownsville, Tex.
* Chavarría,	"	550 50 589	"
* Chilpancingo,	"	500 45 589	"
* Ixtlahuaca,	"	450 40 589	"
* Panuco,	"	575 51 589	"
* Penjamo,	"	350 31 589	"
* Salvatierra,	"	375 33 589	"
* Tulancingo,	"	420 41 589	"
* Tlalpujahua,	"	450 42 589	"
* Tixtla,	"	500 45 589	"
* Villa Union,	"	575 52 589	"
* Bonds Mills, Mich.,		60 4 209	Grand Rapids,
* Boyne Falls,	"	75 5 209	"
* Kalkaska,	"	60 4 209	"
* Mancelona,	"	60 4 209	"

200 Roberts' Landing, Mich.

447 Freeman, Mo.

399 Ozark, Phelps Co., Mo., P. O. A. Ozark Iron Works.

* Barnaby's River, N. B., 30 2 3 Sackville.

* Kouchibouguac, " 30 2 3 "

* St. Peters, " 30 2 3 "

46 Craigville, N. Y.

74 Geddes, N. Y., check Syracuse.

74 Warners, N. Y.

* Alvinston, Ont.

* Attercliffe, "

* Ayton, "

* Bainsville Sta., Ont.

* Belmont, "

* Burford, "

* Burnstown, "

* Buxton, "

* Carleton, "

* Claremont, Victoria

Co., Ont.

* Couchiching Hotel, Ont.

* Couplpy's Bay, Ont.

* Dartford, "

* Doon, "

* Dutton, "

* Emerson, "

* Essex Centre, "

* Escott, "

* Elkfrid, "

* Freelon, "

* Fort Erie Sta., "

* Franktown, "

* Hagersville, "

* Hawtre, "

* Highgate, "

* Iona, "

* Jordan, "

* Kilbride, "

* Kingston Mills Sta., Ont.

59 Hatfield, Pa., check Lansdale.

28 Carpenter, Pa.

* Broseaus, Que.

* Cacouna Sta., Que.

* Chambly Basin, Que.

* Coaticoke Sta., "

* Compton, "

* East Farnham, "

* Gilmour's Hull Mills, Que.

* Grand Pabos, "

* Hillhurst, "

* Kingsbury, "

* Lachute Mills, "

* Les Eboulements, "

* Mansonville Sta., "

* Montmorency, "

* Murray Bay, "

* Point Platon, Que.

* Queensville, "

* Rawdon, "

* St. Alexis, "

* St. Denis, "

* St. Germain, "

* St. Irene, "

* St. Jacques, "

* St. Liboire, "

* St. Paul, "

* St. Roch, "

* St. Zedique, "

* Sanit au Recollet, Que.

* Shawville, "

* Trois Pistoles Sta., "

165 Early Branch, S. C.

164 Batesburg, S. C., formerly Batesville.

425 Allen's Rancho, Texas.

491 Morales, Texas.

500 Wortham, Texas, formerly Tehuacana.

* Middletown Spgs., Vt. 25 2 39 Poultney.

* Wenlock, Vt. 30 2 }

* Colton Hall, W. Va., 50 3 }

133 Greenbrier, W. S. Spgs.

133 Huntington.

ATLANTIC CABLE BUSINESS.

We are notified that the rate from London to Rio Grande do Sol, in South America, has been increased to \$53.35 for twenty words or less.

The Cable between Shanghai and Nagasaki has been repaired.

WILLIAM ORTON, President.

MEETING OF ENGINEERS—RAIL SYSTEM OF ELECTRIC SIGNALING.

Charlton Maddoc, followed Mr. Ellmaker, describing the Robinson Rail System of Electric Signaling. A section of track, a mile or more in length, has metallic continuity throughout, and is separated from other sections by wooden joint blocks. At one end of the section a battery is placed. Its opposite poles are connected with the parallel rails by wires. At the other end of the section there is a relay, which has its wires connected with the parallel rails, of the same section. As the circuit is ordinarily closed, the armature of the relay is held close.

The relay is so arranged that when the current does not pass, the falling away of the armature throws the current of a second battery into an electro-magnet, by means of which the signal is raised. Now the current ceases to pass through the coils of the relay; when a train comes upon the section the current takes the shorter circuit through the car-axles.

This apparatus has been tried upon the Philadelphia, Wilmington, and Baltimore Railroad.—*Polytechnic Bulletin*.

AN official memorandum, dated July 27, from the Eastern Telegraph Company, states: "This company's direct cable to Lisbon is repaired, thus restoring submarine telegraphic communication with Portugal, Gibraltar, Malta, Egypt, India and the far East."

THE Eastern Telegraph Company have notified that their Vigo-Lisbon cable, which was interrupted by the steamship Chimborazo last week off the river Tagus, is now repaired, so that the whole of the company's lines are in perfect working order.

THE Western and Brazilian Telegraph Company (Limited) have received intimation that the land lines connecting Rio Grande do Sul with Montevideo will be open for traffic about the 30th inst. Through telegraphic communication will be thus effected between Europe, the River Plate and the west coast of South America. The anticipated delay to through messages for Montevideo, Chili, etc., occasioned by the loss of the steamship Gomas with the Rio Grande do Sul and Chuy cable will thus be obviated.

A NEW cable between Shetland and Orkney has been successfully laid by the steamer Caroline.

ELECTRO-TELEGRAPHIC PROGRESS.—Not long ago it was thought to be impossible to send two messages along a telegraph wire in opposite directions at the same time. But proof was given that it could be done; and now, by an ingenious arrangement of coils and batteries and their connections, circuits can be formed through which cross-messages are sent as ordinary business; and "duplex telegraphy" has passed into common use. Mr. Heaviside, of Newcastle-on-Tyne, says, that already it is theoretically possible to send any number of messages at once along a single wire, and in opposite directions, and without interference. "From experiments I have made," he continues, "I find it is not at all a difficult matter to carry on four correspondences at the same time, namely, two in each direction; and it seems not improbable that multi-telegraphy will become an established fact."—*Builder*.

THE total number of messages forwarded from postal telegraph stations in the United Kingdom during the week ended the 18th of July, 1874, and during the corresponding week of 1873 were respectively, for the week ended the 18th of July, 1874, 410,351; for the week ended the 19th of July, 1873, 361,789; increase in the week of 1874 on that of 1873, 48,569.

THE SERVICE.

WESTERN UNION TELEGRAPH COMPANY,

JULY, 1874.

APPOINTMENTS.

F. Bradnack, 145 Broadway.
 J. Calahan, "
 J. Donnelly, "
 H. L. Gramsow, "
 E. Gordon, "
 W. H. Jones, "
 M. Lyons, "
 Jno. Mathew, "
 F. Bradnack, 134 Pearl street.
 W. M. Cooke, Canal street.
 M. Dunivan, Cotton Exchange.
 R. McMahon, 8th avenue.
 A. Y. Reid, Windsor Hotel.
 M. F. Smith, Bethlehem, N. H.
 C. H. Holbrook, Brandon, Vt.
 F. A. Murray, Crawford House, N. H.
 E. S. Heath, East Andover, N. H.
 Miss M. J. Barcroft, Fabian House, N. H.
 A. B. Howe, Glen House.
 A. R. Thorne, Mt. Washington.
 J. H. Priest, Mt. Wash'n Depot.
 J. F. Shorey, Profile House, N. H.
 J. A. Fogg, Plymouth.
 F. D. Leonard, Twin Mt. House.
 W. P. Merrill, Waumbec.
 F. L. Fancher, Albany, N. Y.
 G. E. Wilmarth, Greenwich, N. Y.
 Miss L. B. Moore, Hudson.
 E. L. Reynolds, Norwood, N. J.
 H. C. Breed, Round Lake, N. Y.
 J. M. Moffatt, Saratoga, N. Y.
 E. D. Chase, "
 W. E. Tenney, "
 H. G. Mosler, "
 F. Bounce, "
 W. A. Patterson, "
 G. A. Benton, "
 E. E. Weller, Tenafly, N. J.
 Miss J. Wilson, Woodlawn, N. Y.
 W. T. Dennison, Passakeag, N. B.
 R. S. Harris, Thomson, N. S.
 Miss E. McKinnon, Boston, Mass.
 Miss M. A. Nash, Boston, Mass.
 Miss E. M. Kite, "
 Miss J. Cunningham, "
 Miss A. S. Hodges, Cambridgeport, Mass.
 E. S. Riedon, Duxbury, Mass.
 C. Leonard, East Lynne, "
 W. H. Austin, Meriden, "
 Miss L. A. C. Miller, Putnam, Ct.
 Miss M. P. Center, Plympton, Mass.
 S. McLaughlin, Providence, R. I.
 E. K. Kelsey, Stoney Creek, Ct.
 Miss C. Bugbee, Watch Hill, R. I.
 J. C. Robinson, Newport, R. I.
 W. E. Savage, Ithaca, N. Y.
 B. H. Griffin, Lockport, N. Y.
 E. Way, Port Byron, N. Y.
 C. A. Wells, Capon Spgs., N. Y.
 F. W. H. Kurtz, Jordan Spgs., N. Y.
 D. C. Aughenbaugh, Hagerstown, Md.
 J. J. Johnson, Annapolis, Md.
 W. E. Brannon, Asbury Pk., N. J.
 J. M. Farrell, Mauch Chunk, Pa.
 J. E. Janney, Ocean Grove, N. J.
 A. M. Bloomer, Eagle Sta., N. Y.
 R. C. McCredy, Phila., Pa.
 G. A. Jones, Wilkesbarre, Pa.
 E. J. McKary, Milwaukee, Wis.
 C. M. Hazleton, Peoria, Ill.

RESIGNATIONS.

J. H. Emerick, 145 Broadway.
 W. S. Lewis, "
 A. J. Locke, "
 E. S. Riedon, "
 E. W. Emery, "
 M. A. Brien, 1208 Broadway.
 W. W. Smith, Cotton Exch'g.
 J. H. Null, Hunters Point.
 J. H. Caper, Brattleboro, Vt.
 C. M. Brady, E. Andover, N. H.
 F. S. Smith, Albany, N. Y.
 N. T. Andrews, Gr'nwich, N. Y.
 J. H. Roberts, Round Lake.
 P. Erhart, Woodlawn, N. Y.
 S. McWha, Benton, N. B.
 T. Tays, Passakeag, N. B.
 F. A. Taylor, Sackville, N. B.
 L. E. Bordon, Thompson, Mass.
 Mrs. M. A. Pope, Boston, Mass.
 Mrs. W. W. Wood, "
 Mrs. H. M. Chapmar, "
 Miss L. R. Smith, "
 Miss E. M. Kite, Cambridgept.
 Miss E. M. Beckwith, East Lynne, Conn.
 Miss E. Davis, New Lond., Ct.
 Miss E. Holmes, Putnam, Ct.
 H. Rathemich, Providence, R. I.
 W. Beach, Stony Creek, Ct.
 H. W. Smith, Ithaca, N. Y.
 J. P. Lane, Lockport, N. Y.
 A. M. Howard, Port Byron, N. Y.
 W. O. Eastlake, Jordan Spgs., N. Y.

J. Halley, Cheyenne, Wy.
 A. W. Brown, Corinne, Utah.
 Thos. Curtis, Nickerson, Neb.
 W. H. Murphy, Omaha, Neb.
 W. H. Harrington, Salt Lake.
 M. Ogden, Cresson Spgs.
 C. Williams, Fagnodus, Pa.
 Ollie Irons, McKeesport, Pa.
 H. W. Rathbun, Oil City, Pa.
 B. Wilkins, Petroleum Centre.
 J. H. Henstra, Pittsburgh, Pa.
 S. J. Armstrong, "
 G. K. Stanton, Cincinnati, O.
 E. A. Brakenridge, Ausable, Mich.
 G. A. Lied, Cleveland, O.
 J. H. Simmons, "
 C. Baxter, Detroit, Mich.
 J. P. Lane, "
 Mrs. E. Ward, E. Saginaw, Mich.
 Miss F. C. Bascom, Little Mt., O.
 M. J. Green, Renova, Pa.
 E. M. Marsh, Saginaw City, M.
 C. H. Moore, Toledo, O.
 Wm. Henry, Whitefish Pt.
 F. Samuels, Richmond, Ind.
 J. S. Nelson, St. Louis, Mo.
 T. P. Cook, St. Louis, Mo.
 L. F. Sheldon, Superintendent, M. E. & T. R. R.
 Miss E. Irons, Indiana, Pa.
 G. W. Walker, Jordan Alum Springs, Va.
 R. G. Mabry, Laurinburg, N. C.
 T. J. Concannon, Portsmouth, Va.
 E. F. Riddick, Bath Alum Spgs.
 W. C. Waseky, Alleghany, Va.
 H. F. Lines, Sweet Chalybeate Springs.
 C. C. Brown, Sweet Springs.
 H. Campbell, Ellentown, S. C.
 C. B. Coburn, Altman, "
 A. B. Coburn, Varnesville, "
 W. F. Brice, Acton, "
 M. B. Sams, Pt. Royal, "
 M. S. Fielding, Berzella, Ga.
 E. S. O'Brien, Barnet, Ga.
 O. H. Spracklin, Augusta, Ga.
 J. H. Bowman, West Point, Ga.
 W. Redus, Enterprise, Miss.
 J. R. Billington, Palmetto, Ga.
 J. H. Norrell, Tallassie, Ala.
 J. Daniels, Benton, Ark.
 W. F. Hudgins, Hallville, Tex.
 E. B. Vosburg, Houston, "
 J. H. Cade, Little Rock, Ark.
 E. W. Young, Manor, Tex.
 Wm. Penman, Peach Orchard, Ark.
 P. A. Lacy, Plano, Tex.
 L. H. Wise, Walnut Ridge, Ark.
 J. M. Wasson, Williamsville, Mo.
 S. M. Love, Bon Aqua, Tenn.
 G. H. Fendarvis, Edgar, Tenn.
 J. F. Sinclair, Louisville, Ky.
 R. S. Tankesley, McKenzie, Tenn.
 G. A. Punnam, Memphis, Tenn.
 J. P. Dodge, "
 W. W. Allen, Troy, "
 W. H. Hamley, Sparta, Ky.
 J. P. Lamence, Huntingdon, Ten.
 P. D. Sales, Cedar Hill, Tenn.
 B. Hughes, Crystal Spgs, Miss.
 W. M. Carter, Frenier, La.
 R. Person, Waterford, Miss.

W. H. Miller, Ocean Grove, N. J.
 W. H. Boggs, Lancaster, Pa.
 J. Walton, Philadelphia, Pa.
 J. B. Smith, Phoenixville, Pa.
 F. B. Moxen, Wash'ton, D. C.
 J. T. McCook, "dead," Washington, D. C.
 E. S. Patton, Milwaukee, Wis.
 E. Myers, Peoria, Ill.
 D. H. Ogden, Cheyenne, Wy.
 E. Conway, Corinne, Utah.
 M. F. Seeley, Nickerson, Neb.
 T. J. Halley, Omaha, Neb.
 H. C. Craig, Fagnodus, Pa.
 R. L. Rigg, McKeesport, Pa.
 J. F. Henrici, Parker's Landing, Pa.
 H. W. Rathbun, Pet Centre, Pa.
 M. Ogden, Pittsburgh, Pa.
 J. S. Williams, Cincinnati, O.
 C. W. Wilson, Moorestown, Pa.

TRANSFERS.

Name.	From.	To.
P. Carroll	Cotton Exchange	1208 Broadway
E. C. Boileau	Washington, D. C.	145 Broadway
P. V. Degraw	"	"
Miss A. Elliott	14th st. and 3d av.	"
A. R. Eaton	Astor Place	Cooper Union
T. Gregg	Canal street	337 Broadway
C. B. Hoff	145 Broadway	14 Broad street
L. Kirchbaum	14 Broad street	Pier 41, N. R.
L. B. Moore	23d st. and 8th av.	Hudson, N. Y.
W. G. Mosler	Windsor Hotel	Saratoga, N. Y.
H. W. Page	Canal street	337 Broadway
Mary E. Read	Everett House	23d st. and 8th ave.
Emma Reynolds	14th st. and 8d ave.	Norwood, N. J.
Mrs. Stoll	14 Broad street	Cotton Exchange
Wm. Taylor	Canal street	337 Broadway
Miss L. M. Walker	Astor Place	145 Broadway
E. W. Dutton	Brandon, Vt.	W. R. Junct.
A. C. Cutter	White River Junct.	Brattleboro, Vt.
P. L. Kilner	Armenia, N. Y.	Pawling, N. Y.
G. Davison	Pawling, N. Y.	Armenia, N. Y.
J. E. Strong	Annapolis, Md.	Washington, D. C.
W. H. McKeldin	Washington, D. C.	Baltimore, Md.
H. W. Clarke	Wilkesbarre, Pa.	New York
W. A. Pillow	Little Rock, Ark.	Austin, Tex.
H. Riley	Benton, Ark.	Prescott, Ark.
D. E. Bard	Plano, Tex.	Bremond, Tex.
B. S. Pillow	Jefferson, Tex.	Austin, Tex.

VAPORIZING METALS BY ELECTRICITY.

The following simple results, communicated to *Nature* by G. H. Hopkins, obtained by frictional electricity, may be of interest, perhaps too, of use, in the investigation of certain minerals and the action of intense heat upon them.

The description of a characteristic experiment is all that will be necessary to explain the process and to show how similar results may be obtained from other substances. A very fine thread of sheet platinum, of about an inch in length, is placed between two microscope slides of glass, and two pieces of thin sheet copper with rounded ends are placed in contact with the extremities of the platinum, the copper being any of convenient length and breadth, so as to extend beyond the glass slides, but not to be as broad; a charge of electricity from about eight square feet of Leyden jar is passed through the metals; the effect of the heat from the charge is to vaporize the platinum, which is instantly condensed in a transparent layer upon the cold glass.

Copper, tinfoil, tinfoil amalgamated with mercury, gold and silver, can be used in a similar manner, but they produce layers very dissimilar in appearance. To act upon finely ground substances, such as vermillion, sulphate of antimony, sulphur, etc., a line of the powder must be made and the charge be passed through in the same way as through the platinum.

Part of the vapor escapes from between the slides, but this can be easily condensed upon each of two pieces of glass placed in such a way as to intercept the vapor as it passes from between the two slides; it is then condensed in a long but narrow line. The manner in which the glass is affected by the heat, and the concussion produced by the expansion of the vapors, are worthy of notice.

Considerable difficulty will be found in vaporizing copper, doubtless from its being such an excellent conductor. Some of the powdered substances appear to require a small spark to be passed through them before they allow a larger charge to pass, as if the particles needed polarization.—*Scientific American*.

ELECTRO-VIGIL.

An apparatus for the detection of fire, invented by M. Vincent Lanzillo, and already used with success in Italy. The principle of the invention is that increase of temperature beyond a certain point, arising from a conflagration, sets the apparatus in motion, and prints through a Morse the actual locality of the fire. For instance, in each room a thermometer is placed in the spot where danger is most likely to be apprehended. The thermometer has two wires inside the stem; one leading down into the mercury, the other near the top, or beyond the height of the ordinary summer temperature of the place. The other ends of the wires are in connection with the opposite poles of a battery. Should a fire take place the extraordinary rise of temperature causes the mercury to ascend, and thereby closes the circuit, which includes an electro-magnet. On the current being established this electro-magnet sets in motion an automatic manipulator, driven by clockwork and composed of a metal zone. Ivory and metal spaces, of longer or shorter duration, and corresponding to the dots and dashes of the Morse letters for the locality of the room, are let into the rim or circumference of this manipulator. The electro-magnet detaches a lever which, releasing the manipulator, sets the wheel in motion, so that the conducting and insulating surfaces make and break another circuit through a wire leading away to the watchman's office, where the Morse records the message on the wheel, viz., the particular room where the fire has broken out.

DELAY IN THE COMPLETION OF THE DEMERARA CABLE.—A press telegram dated Kingston, Jamaica, August 10th, states that the cable between Cayenne and Demerara will not be completed before October.

The cable steamship Hooper will return to London for additional supply of cable to duplicate the lines between Demerara and Jamaica.

THE SYDNEY AND NEW ZEALAND CABLE.—Austrian advices of July 4th, state that after an ineffectual effort to take the first of the deep sea soundings for the Sydney and New Zealand cable the discovery ship Challenger returned to Sydney through stress of weather. Five days elapsed before she again resumed her work, the results of which are daily expected from New Zealand. The other cable route, to which the credit of the colony is pledged, has been already surveyed, and as soon as the contractors are ready to lay it from Banjowangie to the Gulf of Carpentaria they will find Queensland government officials at the latter place ready to receive it and connect their land lines.

MARRIED.

WENGER—COPELAND.—At Wichita, Kas., August 17, 1874, by Rev. J. P. Hanson, L. B. Wenger, operator, Wapella, Ill., to Fannie Copeland, of Wichita, Kas.

BORN.

At Gardner, Ill., August 18th, 1874, to E. L. Shaw, agent and operator, C. & A. R. R., a daughter.

At Greensburg, Ind., August 5th, 1874, to Dave A. Weaver, night manager, W. U. office, a son.

At Richmond, O., August 18th, 1874, to Geo. W. Holland, agent and operator, C. & G. W. R. R., a daughter.

To Fred Thompson, agent and operator, Lynn, Ill., on July 26th, 1874, a son.

To Charles F. Moseley, manager, Bergen, N. J., August 22, a daughter.

WINTERS.—At Carlisle, Ohio, August 22, 1874, to John C. Winters, agent and operator, C. H. & D. R'y, a son.

At Emigrant Gap, Placer Co., Cal., August 21st, 1874, to the wife of Joe. F. Bolden, a daughter.

Journal of the Telegraph.

This Journal is issued on the 1st and 15th of each month. Its circulation is over 8,000. It goes to every State, Territory and Province on the Continent. It has become a necessity, and is always welcomed as a friend. No better medium for advertising exists.

TERMS:

TWO DOLLARS PER ANNUM IN ADVANCE.

Address—

JOURNAL OF THE TELEGRAPH,

Western Union Telegraph Company,

145 Broadway, New York.

NEW YORK, SEPTEMBER 1, 1874.

In the six months ended June 30, 1874, the value of telegraph wires, apparatus and material exported from Great Britain was £1,579,754; in the same period in the preceding year, £702,440.

MANAGERS of offices are informed that the Company have prepared two quire Register Books, for the use of the smaller offices. They can be had by requisition upon the Superintendent.

THE illustrated article upon Meyer's Autographic Telegraph Apparatus, which appeared in the JOURNAL of August 15th, was translated from the *Journal Télégraphique* of April 25th.

By a despatch from Superintendent Merriweather, we learn that A. G. Martin, a member of the Telegraphers' Mutual Benefit Association, died at Canal Station, Alabama, of bilious fever, on the 26th inst. He was one of the earliest members, the number of his certificate being 376.

By some singular misunderstanding, messages for WESTPORT, N. Y., have been refused at many of the principal offices, greatly to public injury. It is an office of the Montreal Telegraph Company on the west shore of Lake Champlain, and with which many persons desire communication, especially during the Summer months, and is open throughout the year. Offices were so notified in JOURNAL of May 1.

MANAGERS will observe that the rules require that all free messages, except service messages, local railroad messages, and those of the officers of the Company, must be recorded and returned with the free message reports, and that the reason why free must be stated in the check.

Messages checked "D. H. no account," or bearing other evidence of intention to violate the above rule and prevent proper returns, should be intercepted at repeating offices and reported to the District Superintendent.

LIGHTNING.

The Summer of 1874 will long be remembered as one remarkable for destruction of life and property by lightning. From all parts of the country, and, at one period of the Summer, almost daily, the telegraph bore to the daily press, tidings of deaths and damages caused by storms in which, in an extraordinary manner, the electric javelin of the sky made havoc on the earth. There lies before us, as we write, a letter from a man disabled for life while in the performance of his duties inside his office, as an operator; and it is only a few days since the writer of this was commissioned to break the intelligence to the young wife of a repairer, of his death by lightning, while, unsuspecting of danger, he was unloosing the tools from the wire which he had just joined.

In a former number of the JOURNAL, we expressed the conviction that the time had come when our knowledge of the methods of protection from atmospheric discharges warranted the executive officers of telegraph companies to regard as a proper subject for discipline any injury to office instruments from this cause. Orders given since then, and which we rejoiced to see, will, we trust, secure the needed protection. No manager of an office should feel that he has done his duty to himself or family until he has secured every known means of averting personal injury to which all have been so long more or less exposed. It is a duty also to the company whom he serves. There should never be recorded again, a single case of a burned magnet, a wounded operator, or a slain man from contact with the wires, unless under extraordinary circumstances such as no care could prevent.

Although it is now the season when exemption from danger of this kind may be expected, yet we give a word of caution to the men who perform line work, and who are liable, like young McPherson, who fell by a lightning bolt near Cimmaron, a few weeks ago, to danger from this cause. More care must be taken. It is not enough that you have for twenty years or more escaped injury. The question to you should be, "Am I in peril?" If you are, you owe it to yourself and those dependent upon you, to remove the danger. And you owe something, too, to the public, who will deem it an unpardonable offence when an intelligent man, serving a company old enough to know how to protect its men from harm, falls dead by a bolt, the nature and the terror of which, he, of all men, should understand and know how to avoid. Bear with us while we make the following simple suggestion. It is not very scientific. There are no ohms about it, not even a farad. It is derived from our own experience. Some day it may save a life.

In repairing a break, the exposure to injury from lightning is specially great while the two ends are yet unconnected in the repairer's hands, even when no storm seems present. The shaft may be many miles away. The danger is not removed when the joint is made, but while the wire is still held by the hands of the repairer before elevating to its place. Now if each repairer would carry with him two

small chains, with a hook at one end and a sharp point at the other, grasping the wire on either side of him with the first and sticking the other into the earth, he could invariably perform his work in safety. It is an easy thing to do. Perhaps one man in twenty will do it. Nineteen will grin at the advice and the device, and despise both. Only this, now mind, if any man of you gets killed hereafter like McPherson at Cimmaron, don't let him blame us for the hole in his hand through which death found his heart and stopped it.

HON. MARSHALL JEWELL.

To-day, Hon. Marshall Jewell, recently our Minister at St. Petersburg, assumes the important duties of Postmaster-General. Twenty-five years ago Mr. Jewell was engaged in the telegraph business as an operator. In the qualities which fit him for his high trust, his telegraphic experience will be useful to him. In that experience is the assurance of the intelligent treatment of the subject of the Postal Telegraph. It will not surprise us if the new Postmaster General should give the first indicative proof of his wisdom by leaving the matter severely alone.

We are the more inclined to expect this, from the report which comes authenticated to us that Mr. Jewell personally investigated the whole subject of Governmental Telegraphic management in Europe prior to his return. Such an investigation, thoroughly made, we believe, can have but one result. The European Telegraph system, with a tariff relatively higher than ours, is sustained by national taxation. With the highest executive and scientific talent, its average product is an annual debt. It is an experiment the nation cannot afford.

THE Great Eastern, having taken in her stock of coal at Portland, has sailed for Heart's Content to lay the second cable of the Anglo-American Company, which has been provided by the directors without the necessity of increasing the capital of the company.

THE number of messages passing over the Cuba Submarine Telegraph Company's line during the month of July, amounted to 1,758, estimated to produce £2,000, against 1,078 messages, producing £1,065, in July last year.

THE total number of messages forwarded from postal telegraph stations in the United Kingdom during the week ended the 1st inst. was 408,286; total number of messages for the week ended August 2, 1873, 376,674.

THE second and third cables have been successfully submerged across the Simonoseki Straits, Island of Nippon, Japan—the former on the 14th of May, and the latter on the following day. The cables are of the same size as the shore end of the Atlantic cables.

The Western and Brazilian Telegraph Company received on Thursday an intimation that the land lines connecting Rio Grande do Sul with Montevideo are completed and open for traffic. Communication by telegraph is thus established between Europe, the River Plate, and the West Coast of South America.

THE BRITISH TELEGRAPH SORROW.

Editor of the London Times :

SIR: In the House of Commons debate, reported in *The Times*, Mr. Fawcett and other hon. members alluded to the "extraordinary blunders" committed by the Government in its haste to acquire the telegraphs, by failing to take into account the claims of a great number of railway companies, over whose lines the telegraphs were placed, which companies had since delivered claims amounting to four or five millions. In reply, the Chancellor of the Exchequer is reported to have said:

"With regard to the telegraphs, that subject certainly seems to be, with some gentlemen, a skeleton in the closet. We really know very little about it; but a decision lately given in the Court of Exchequer has very materially relieved the Government, and when the net result is arrived at, I believe the apprehensions entertained will be found very much exaggerated. At all events, it would be absurd and quite out of the question to ask the Committee to reserve a surplus of millions with a view to meet such a contingency."

We fear the ingenuous expression, "We know very little about it," is only too true, and that the Government will have to confess by and by that the apprehensions entertained were by no means exaggerated.

The decision in the Court of Exchequer was given in the case of a small railway company which had leased certain telegraphic rights to the late Electric and International Telegraph Company for a term of years, with valuable reservations. The Telegraph Company's interest had been purchased by the Government, and the application to the Court was for a *mandamus* (under the provisions of the Lands Clauses Act, 1845) to compel the Board of Trade to appoint an umpire to settle the railway company's claim, the Post-Office arbitrator having refused to concur in such appointment. The Court refused the application on the ground that this claim was not within the provisions of the Telegraph Acts, 1868, 1869. The company's position was, however, identical with such of the larger railway companies as happened to be (in consequence of their opposition) included in the compensation clauses of the Telegraphic Act, 1868. The Company's advisers were not at the time aware of the correspondence which passed between the Post-Office authorities and the agents for several railway companies which, not being specifically named in the second Telegraph Bill, 1869, opposed it. In that correspondence the Post-Office solicitor writes, "The term 'Telegraph Company' is to mean any company authorized to transmit telegrams. That includes a railway company. That is our meaning, and that, I submit, will be the operation of the clause." Upon such written assurance the opposition was withdrawn, and the Government have since paid the companies compensation; yet, in the face of that assurance, the Post-office authorities now repudiate the claims of the other railway companies, whose position is precisely similar to that of those to which the correspondence refers. Could this correspondence have been produced at the hearing the *mandamus* asked for would, doubtless, have been granted. Moreover, the Post-Office have already paid very large sums of money under awards and otherwise to companies exactly in the position of our clients. But now, these blunders being exposed, they, after possessing themselves compulsorily of our clients' property, affect to have discovered at the eleventh hour some legal quibble, on which they turn round and decline to pay compensation for it.

HARGROVE, FOWLER, and BLUNT,
Solicitors.

THE NEW CODE OF RULES.

From Mobile, Ala.

In the proposed new code of rules the following occurs:

PROFANITY FORBIDDEN.

"Profane, obscene, or other ungentlemanly language will not be allowed upon the wires, nor in the offices of the Company."

This is not strong enough. Add the following:

"The district superintendent will promptly discharge any man in his district who is convicted of such offence. Managers and chief operators are particularly instructed to stop this practice, and to gather evidence in every case, and report to the district superintendent. Managers and chief operators who allow these vile practices and make no effort to stop them, will be considered unworthy of holding their positions."

THE BEAUTY OF HUMILITY.—A couple of neighbors became so inimical that they would not speak to each other; but one of them, having been converted at a camp meeting, on seeing his former enemy, held out his hand, saying, "How d'ye do Kemp? I am humble enough to shake hands with a dog."

THE Chinese authorities have consented to a telegraph line being erected between the Pagoda anchorage and the foreign settlement of Foochow.

In the Yuba County Hospital, California, interesting experiments have been made with a magnet for the cure of rheumatism and paralysis. A large horse-shoe magnet is used, and one case of paralysis has been almost cured, and cases of chronic rheumatism relieved.

ALTHOUGH platinum is one of the heaviest of metals, yet its ductility is so great that Wollaston succeeded in drawing it into wire having a diameter of only one thirty-thousandth part of an inch, a size so small that a mile length of the wire would weigh only one grain.

THE TELEGRAPH IN GUATEMALA.—Among other improvements by the present administration of Guatemala, telegraphic communication now exists throughout the country and connected also with all the ports and principal towns of Salvador. News by the up steamers is now transmitted to Guatemala from La Union three days before the arrival of the steamer at San José.

TOOTHACHE CURED BY ELECTRICITY.—Dr. Bouchard, of Paris, says that toothache may be almost instantly arrested by a constant battery current from ten cells. The positive pole is placed against the jaw, on a level with the painful tooth, and the negative pole to the antero-lateral region, on the same side of the neck. How kind it would have been if Dr. Bouchard had only told us where the "antero-lateral region" is! When we read it we could appreciate the feelings of Ben Johnson's fish wife when he called her a parallelogram.

INFORMATION WANTED.

Will some one of the craft inform me, through mail, the whereabouts of H. S. Howell, operator. The last heard of him was at Cornland, Illinois. Any information, will be appreciated by his friends, and especially relieve his mother of a fearful suspense.

R. E. HOWELL,
Forest City, Holt Co., Mo.

September 1, 1874.

THE TELEGRAPHERS' MUTUAL BENEFIT ASSOCIATION.

Established October 22, 1867.

NUMBER OF MEMBERS AUG. 1, 1874, 1,200.

RESERVED FUND, \$4,000.

Since the organization of the Association, it has paid out to fifty-nine bereaved families \$51,217.44. The mortality during that period has not averaged more than one per cent. per annum. Taking \$1,000 as the payment at death, the total cost to members for the seven years past has not been more than one per cent. per annum, even averaging the membership as low as eight hundred. It is the cheapest, simplest, most purely benevolent association in existence. It was designed to protect the families of telegraphers. It has done so promptly and satisfactorily. It has been so successful that from accumulated funds it is now able to pay one assessment without call on its members.

Many are enquiring about this institution and how to join it. The following are the steps to be taken:

1. The applicant must be one who is or who has been employed in telegraph service.
2. Application must be made on the blank forms of the Association, which can be obtained by application to any of our Agents or from the Secretary. The forms of application explain the information required from applicants.
3. The initiation fee is at present \$3.50. The fee is graduated by the amount of accumulated funds of which a new member has the benefit. There are no other payments until the death of a member, when One Dollar is called for from each living member. This is all. The present rate of death is about one each month. The payment at death is \$1,000. Members do not forfeit membership by retiring from the business, although members are not desirable or desired who do not design following it. Settlements with heirs are made sixty days after death.

The following are the Agents of the Association:

Albany, N. Y., CHAS. C. KING. Milwaukee, Wis., D. H. HENSHAW.
Augusta, Ga., J. M. CROWLEY. N. Orleans, La., JAS. T. ALLEY.
Atlanta, Ga., J. HERRICK. Nashville, Tenn., J. B. MORRIS.
Balt'e, Md., ARCH. WILSON, Jr. Phila., Pa., JAS. MERRIHEW.
Boston, Mass., E. A. BEARDSLEE. Phillipsburg, N. J., JOHN FULLER.
Buffalo, N. Y., J. W. TILLINGHAUST. Peoria, Ill., DAY K. SMITH.
Cincinnati, O., F. A. ARMSTRONG. Pittsburg, Pa., S. L. GILSON.
Cha'ston, S. C., J. D. EASTERLIN. Plattsburg, N. Y., WARREN DOW.
Chicago, Ill., F. W. JONES. Po'keepsie, N. Y., S. K. RUPLEY.
Cleveland, O., H. L. MELTON. Port Har'g's, C. B., T. D. SCANLAN.
Clinton, Ia., E. O. WAIT. Richmond, Va., R. M. J. PAYNTER.
Dubuque, Iowa, E. SHOLES. Scranton, Pa., R. O'BRIEN.
Detroit, Mich., W. A. JACKSON. Syracuse, N. Y., D. L. PIKE.
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Harrisburg, Pa., H. A. CLUTE. San Fran'co, Cal., N. H. BROWN.
Halifax, N. S., A. E. HOYT. Seattle, Wash. Ter., F. H. LAMB.
Indianapolis, Ind., D. C. HINS. Springfield, Mass., W. J. DENVER.
DALE. Springfield, Ill., W. W. KELCHNER.
Kansas City, Mo., M. D. WOOD. 61 B'w'y, N. Y. City, C. S. H. SMALL.
Lafayette, Ind., H. E. DOOLITTLE. Toronto, Ont., A. HUNTER.
Little Rock, Ark., I. C. BAKER. Vincennes, Ind., PERRY HOOD.
Louisville, Ky., WM. DEERER. Washington, D. C., M. MARRAN.
Mobile, Ala., WM. SANDFORD. White Riv. Junc. Vt., G. W. GATES.
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J. D. REID,
W. HOLMES, *Treasurer.*
Secretary, Box 3893, New York.

THE TELEGRAPHERS' MUTUAL BENEFIT ASSOCIATION.

ACKNOWLEDGMENT OF RECEIPTS FOR ASSESSMENTS NOS. 61, 62, 65 AND 66, UP TO AND INCLUDING AUGUST 28, 1874.

ASSESSMENT No. 61.

1968.

ASSESSMENT No. 62.

22, 660, 800, 1600, 1642, 1657, 1934.

ASSESSMENT No. 65.

22, 29, 51, 185, 186, 187, 232, 255, 411, 412, 481, 527, 652, 695, 697, 705, 725, 869, 899, 908, 920, 1028, 1071, 1103, 1208, 1240, 1275, 1289, 1290, 1358, 1400, 1426, 1504, 1531, 1556, 1557, 1559, 1562, 1601, 1608, 1610, 1611, 1612, 1613, 1619, 1639, 1652, 1655, 1670, 1678, 1690, 1691, 1692, 1732, 1741, 1745, 1837, 1838, 1854, 1876, 1877, 1917, 1945, 1946, 1947, 1958, 1987, 1991, 2004, 2035, 2061, 2151, 2160, 2181, 2207.

ASSESSMENT No. 66.

2, 4, 15, 16, 17, 28, 53, 64, 65, 77, 86, 88, 91, 95, 113, 121, 131, 133, 140, 145, 148, 157, 179, 181, 208, 211, 215, 217, 269, 274, 276, 277, 289, 301, 302, 312, 342, 346, 349, 383, 385, 424, 464, 467, 509, 516, 532, 536, 542, 546, 547, 549, 553, 564, 579, 615, 628, 670, 671, 703, 721, 732, 731, 734, 740, 764, 815, 821, 825, 858, 873, 912, 916, 917, 923, 941, 1011, 1013, 1039, 1061, 1126, 1145, 1147, 1154, 1167, 1169, 1175, 1178, 1183, 1199, 1232, 1252, 1259, 1276, 1295, 1298, 1304, 1306, 1325, 1329, 1345, 1357, 1368, 1394, 1396, 1409, 1484, 1489, 1550, 1554, 1555, 1568, 1571, 1579, 1615, 1620, 1658, 1696, 1708, 1735, 1831, 1852, 1862, 1894, 1900, 1901, 1919, 1944, 1950, 1957, 2019, 2020, 2021, 2029, 2030, 2049, 2097, 2103, 2114, 2135, 2138, 2164, 2169, 2174, 2175, 2178, 2179, 2190, 2191, 2197, 2201, 2221, 2228, 2229, 2237, 2239, 2241, 2242, 2257, 2259, 2263, 2264, 2265, 2266, 2267, 2268, 2270.

COATING CAST IRON WITH COPPER.

The Society of Forges and Foundries of Val d'Oise has recently opened in Paris an exposition of their curious products, consisting of objects of art in cast iron, some of considerable volume, which are covered with copper by the Gaudoin process. This operation admits of the deposition of copper upon cast iron without necessitating any previous coating of the latter. The difficulty of accomplishing this has been the scouring of the iron, the baths of chemicals hitherto used being incapable of thoroughly cleaning the metal. M. Gaudoin has found that very acid solutions are necessary to remove the oxides of iron which escape the scouring; but at the same time the acids do not attack the subjacent metal. Such a solution acts continually on the points upon which the copper is not deposited, and ends by dissolving the oxides and allowing the deposition to take place. A large number of organic acids have been found suitable for the purpose. The oxalates of copper combined with the quadri-oxalates of soda are said to give excellent results. An electric current is employed to secure the fixing of a thick layer of copper.—*Scientific American*.

EFFECT OF CONDENSERS ON THE BRUSH DISCHARGE FROM THE HOLTZ MACHINE.—J. W. *Flukes*.—The readiest way of producing the brush discharge is to connect the negative conductor of the Holtz machine with the ground, and to place the hand in its neighborhood with one finger extended toward the positive conductor; the brush then makes its appearance on the positive conductor. Faraday, in his "Experimental Researches in Electricity" (vol. i., p. 454), has fully described this peculiar electric discharge. Since his epoch the use of condensers in connection with electric machines has so altered their range that the following experiments were instituted to observe the effect of such condensers on the brush discharge. *Experiment 1*.—If both condensers were removed from the machine, and the negative pole connected with the ground, the brush made its appearance on the knob of the positive conductor. *Exp. 2*.—A plate of vulcanite, held in the hand, was inter-

posed between the conductors, and produced the same effect as the hand alone; if, however, the vulcanite were supported on an insulated stand, no brush appeared: a metallic disc held in the hand failed to produce the brush. *Exp. 3*.—A condenser was connected with the positive pole, the other connection remaining as before; the brush made its appearance, but was less stable, and consisted of a uniform straight spark of 25 m.m., terminating in interweaving rays: there was a continual tendency to break into the ordinary electric spark, due, doubtless, to the increase of electric density resulting from the use of the condenser. *Exp. 4*.—For the condenser of the machine a larger one, from five to six times its capacity, was substituted: the brush disappeared. *Exp. 5*.—A pointed metallic wire was held in the hand, and directed toward the brush: it immediately disappeared. *Conclusions deduced*.—The use of condensers of large surface is prejudicial to the continuance of the brush discharge. This phenomenon, evidently resulting from the tendency of the electric state on the positive conductor to combine with the state which it induces on a neighboring large and poor conductor, is best produced by a continuous supply of a positive charge, small comparatively in quality, which is continually dissipated by the inductive action of the large body in the neighborhood. Condensers of a smaller extent of surface than those in common use on the Holtz machine appear better adapted to produce a continuous discharge.

CHEAP LIGHTNING RODS.—Cauderay, inspector of telegraphs in Lausanne, calls attention to the fact that charcoal is an excellent conductor of electricity, and proposes to protect detached houses from lightning in a simple, cheap, and ingenious manner based upon this principle. Two long poles are charred throughout their whole length on the surface, and then erected at a short distance from the house, being set deep enough to reach moist earth. They should taper to a cone at the top, and be pointed with metal—an inverted nail or the like. Some old iron could be buried about the foot of the pole, to enable the electricity to pass more readily into the ground. If the charred part wears off it must be charred over again.

ON MAGNETIC BUNDLES MADE UP OF SEPARATED PLATES.—M. *Jamin*.—Combining 22 magnetized plates (each 1 m.m. long, 1 m.m. thick, and 50 m.m. broad) in a bundle, with pasteboard 0.6 m.m. thick between adjacent plates, each plate lost magnetism, and so the bundle, the loss of the latter being 50 per cent, which is less than in the case (first experimented on) of superposition without intervals; the loss was then 66 per cent. In this first mode all the magnetism retained was carried to the exterior; there was none, or almost none, between the plates. In the other mode the quantity remaining (151.1) was divided into two portions:—(1), 85.5, which was expanded on the exterior; and (2), 65.6, which remained in the intervals. With wider intervals the exterior magnetism is diminished, the interior increased; and gradually the plates act as if they were independent.—*London Chemical News*.

TOMMASI'S HYDRO-ELECTRIC CABLE.—M. *Tommasi* has been experimenting lately with his hydro-electric cable, with a view to its practical improvement. With a length of four kilometres he has been able to obtain ten signals in a second. This seems to render it absolutely certain that the velocity of propagation of a shock through compressed water is very much greater than the propagation of sound in water.—*London Chemical News*.

Red Star Line.

Appointed to carry the Belgian and United States Mails.

The following Steamers are appointed to sail

FOR ANTWERP.

From Philadelphia. From New York.

NEDERLAND, Aug. 29. COLINA, Sept. 11.
VADERLAND, Sept. 23. SWITZERLAND, Oct. 5.

FROM ANTWERP.

For Philadelphia. For New York.

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PRICES OF PASSAGE IN CURRENCY.

First Cabin, \$90. Second Cabin, \$50.
Steerage and Intermediate tickets to and from all points at the lowest rates.

Passenger accommodations for all classes unsurpassed. Ample attendance is provided. Every steamer carries a surgeon and stewardess.

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For passage, rates of freight, and other information, apply to GEO. W. COLTON, Agent, 42 Broad Street, N. Y.
JOHN McDONALD, Passenger Agent, 8 Battery Place, N. Y.

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307 Walnut Street, Philadelphia.

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The American Steamship Company of Philadelphia.

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PHILADELPHIA AND LIVERPOOL,

CALLING AT QUEENSTOWN,

Sailing every Thursday from Philadelphia, and

Sailing every Wednesday from Liverpool.

The following Steamers are appointed to sail from Philadelphia.

*KENILWORTH, Sept. 3. PENNSYLVANIA, Sept. 24.
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*ABBOTSFORD, Sept. 17. OHIO, Oct. 8.

PRICES OF PASSAGE IN CURRENCY.

Cabin \$75 to \$100 according to accommodations.
Steerage and Intermediate tickets to and from all points at the lowest rates.

Steamers marked with a star do not carry Intermediate. Passenger accommodations for all classes unsurpassed. Ample attendance is provided. Every Steamer carries a surgeon and stewardess.

These Steamers are supplied with Life-Rafts in addition to the usual Life-Boats and Life-Preservers.

Through tickets and through Bills of Lading issued between all prominent points.

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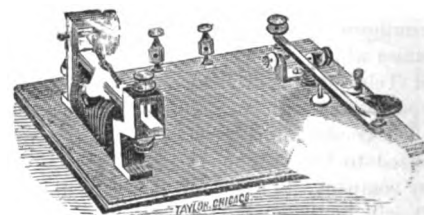
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THE AMATEUR'S Telegraph Apparatus.

(PATENTED APRIL 16TH, 1873.)



With this Instrument is furnished

A Complete Outfit for the Student,

INCLUDING

BATTERY,

CHEMICALS, and

MANUAL.

There are several thousand in use.

PRICES:

Complete Outfit \$7 00
Sonder and Key 6 00
" " with Out-Outs and Lightning Arrestor 7 00
Sonder No. 3 4 00
" No. 4 3 00
Key No. 4 4 00

GEO. H. BLISS & CO.,

41 THIRD AVENUE,

CHICAGO, ILL.

JOURNAL OF THE TELEGRAPH.

VOL. VII. NO. 18.

NEW YORK, SEPTEMBER 15, 1874.

WHOLE NO. 165.

METHODS OF TRANSMITTING TWO MESSAGES ALONG A SINGLE LINE IN THE SAME DIRECTION AT THE SAME TIME.

The first success attained in this direction was by Stark of Vienna, in 1855. His method consists of sending from the transmitting station, by two keys, two currents of different intensities, which on arriving at the receiving station, each set a relay in motion.

The relays are arranged in such a way that, when the weaker currents traverse the line, only one of the relays is put in motion; when the stronger current traverses the line, the other relay is affected; and lastly, when both currents go together, both the relays respond to them.

At the sending station Stark arranged two keys as in the plan figure 1; κ being a simple Morse key, and κ' a similar lever, supplied at the back with an insulated earth contact, which it moves against the two anvils 5 and 6. The usual front and back contacts of the keys are marked in the figure, 1 and 3 respectively, and the levers 2. The battery, which is connected up in series, or one element after the other, is used in two unequal parts, b and c , the number of elements represented by b being double that of c . The battery, c , is put into circuit with the line by pressing down the key κ ; b , by the key κ' ; and both together by depressing both the keys at the same time.

The copper pole c is, therefore, connected to the contact 1 of κ , the zinc pole of same to 5 of κ' . Copper pole of b is connected with 1, and zinc pole with 6 of κ' . Lever of κ' is in connection with the back contact, 3 of κ ; line is brought to the lever 2 of κ , and the back contact of κ' goes to relay, &c.

When κ alone is depressed, the currents of c pass from z (5 and 4 of κ') to earth, and from c (1 and 2 of κ) to line.

When κ' is depressed alone, the currents of b pass from z (6 and 4 of κ') to earth, and from c (1 and 2 of κ') to line.

When both κ and κ' are depressed, the united currents of b and c pass from zinc of b (6 and 4 of κ') to earth, and from copper of c (1 and 2 of κ) to line.

By the depression of one or other or both the keys at the sending station, three currents are therefore produced, whose intensities are in the relation of 1, 2, 3. These currents we will call s , s_1 , and s_2 .

At the receiving station all currents pass through relays I and II, Fig. 2. A common local battery, E_1 , serves both these instruments; its zinc pole being connected with the tongue of each of them, and its copper pole with their metal contacts. The relay II is furnished with outer coils, which are put into circuit with another local battery, E_2 , and a resistance, R , by means of the tongue of relay I.

The tongue of relay I is held on its insulated contact by a spiral spring, whose force is adjusted so that the currents s , or those of the portion, c , of the battery, are unable to move it, but so that it is easily moved by s_1 and s_2 —the currents of section b and the whole. Relay II, on the contrary, is adjusted delicately, so as to be deflected by the weaker currents.

When, therefore, the key κ , at the sending station is pressed down, the current of c is sent through the line, and passes through the coils of relays I and II to

until it balances the magnetizing power of the line current sent by κ .

The third case is that in which, during the manipulation of the two keys, both happen to be pressed down together. When this occurs, the current s_2 of the whole battery goes through both the relays I and II. Relay I is put in action as before, and closes its printing circuit, and that of the counteracting battery E_2 . But as the opposite magnetic effect s_2 of the extra coils of relay II is only equal to that of s_1 , and since s_2 is equal to the sum of s and s_1 , it is evident that the relay II will be acted upon by the difference of the magnetic effects due to the line and the counteracting currents, or by s , which is precisely the same as that produced when κ alone is depressed. The Morse M_1 will therefore also be set in motion. Combinations have been made also, by which in a single line, at the same moment, two messages could be sent in one direction, whilst two were being received from the opposite direction; and thus four independent communications could be kept up. Other arrangements have also been made for telegraphing in the same direction at the same time to different stations along the line, both directly and by translation.

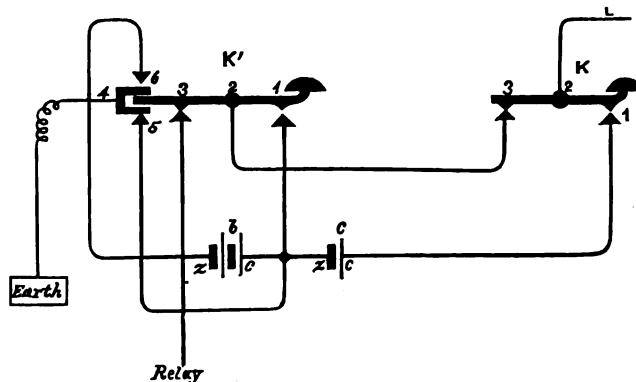


Figure 1.

earth. Relay I is unaffected, but relay II is put in action, and the Morse, M_1 , in the local circuit (E_1 , z , relay II, 3, 2, M_1 , c , &c.) prints whatever signals are given by κ .

When κ' is depressed at the sending station, current s_1 is transmitted, and the tongue of relay I deflected against the local contact. Thus two local

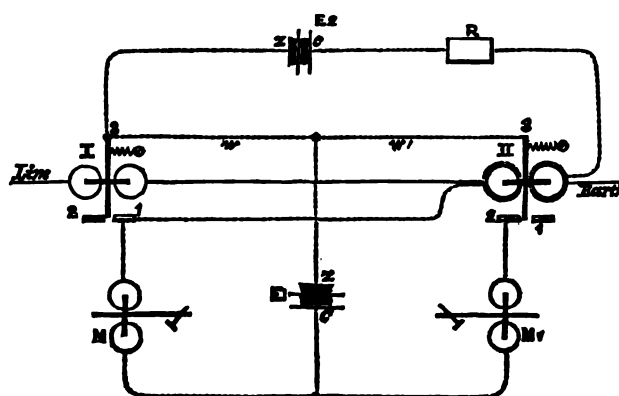


Figure 2.

circuits are closed; the first is that including the battery E_1 , R , and the extra coils of relay II, by which the action of the line current in this relay is counteracted, and the tongue held still against the insulated contact; therefore M_1 does not respond to these stronger currents. The second local circuit is that of the Morse, M , and battery E_1 .

The intensity of the counteracting battery E_2 , whose magnetic effect upon the armature of relay II we will call s_2 , is regulated by the interposed resistance, R ,

Preece, Maron, Edlund and others have invented also many similar and equally beautiful methods, all of which have been tried, but none of which have found their way to any extent to practical application; and the reason is very simply to be found in the varying resistance of telegraph lines, and in the varying electro-motive forces of the batteries, which occasion the inconvenience of having to adjust the systems by means of resistances to compensate these disturbances. Both these systems of telegraphing in opposite directions, and of telegraphing in the same direction more than one message at a time, must be looked upon as little more than "feats of intellectual gymnastics"—very beautiful in their way, but quite useless in a practical point of view.—*Sabine's Electric Telegraph.*

[From the Scientific American.]

THE ELECTROMOTOGRAPH—A NEW DISCOVERY IN TELEGRAPHY.

Within the past few days, we have had under examination, in practical operation in our office, a novel electric telegraph apparatus, which presents some very remarkable features, and promise to result in the creation of an entirely new and advantageous system of telegraphy. It is the discovery of Mr. Thomas A. Edison, of Newark, N. J., who is well known as a telegraph engineer of the highest ability, and the inventor of a larger number of electrical devices, probably, than any other person living. His improvements are employed upon all the various telegraph lines in this country.

No magnet or armature is used. The apparatus is based upon the principle discovered by Mr. Edison, that electricity may be converted into mechanical motion by electro-chemical decomposition.

The apparatus consists of a lever working between two fixed points. Upon the end of the lever is a lead point which rests upon a strip of paper moistened in a chemical solution. This paper is moved slowly by clock-work; this movement, together with the normal friction of the lead point on the paper, carries the lever to the left.

When a current from the line is passed through the lead point and paper to the earth, it converts that portion of the paper under the point, by the chemical reaction, into a new substance which acts as a lubricant. The moment this change takes place, friction almost ceases, and the lever is drawn to the right by a retractile spring.

By the motion thus produced, he works any of the ordinary forms of telegraph printing or sounding instruments or relays, and is enabled to send messages, by direct transmission, over thousands of miles of wire, at the highest speed, without re-writing, delay, or difficulty of any kind. More than this; his apparatus operates in a highly effective manner, under the weakest electric currents, and he is able to receive and transmit messages by currents so weak that the ordinary magnetic instruments fail to operate or even give an indication of the passage of electricity. Thus, when the common instruments stand still, owing to weakness of current, the Edison telegraph will be at work up to its fullest capacity.

The author has baptized his discovery the Electromotograph, which is, perhaps, as good a title as could be adopted.

We subjoin the following original notes by the author, which explain the peculiar principle that lies at the base of his discovery. These notes, we are confident, will be read with very general interest.

To the Editor of the Scientific American:

The electricity, acting by electrolysis, changes the nature of the surface of the paper, either by depriving it of some constituent, or the hydrogen, in conjunction with the metal and paper, form substitution compounds, the surfaces of which are smoother than the paper in its natural state, in the manner that the surface of rough paper is made smooth by dipping it into sulphuric acid. The strangest thing connected with this phenomenon, however, is this:

In trying to ascertain what caused the lever to move, whether it was by reducing the lead by hydrogen to a finely divided powder that acted as a lubricant, or whether the nature of the surface of the lead were changed by the absorption of hydrogen, like palladium, or whether the effect were due to the effort of the gases to escape from under the lever: I was led away from these notions by finding that platinum, with sulphate of quinine, will likewise show the movement. It then struck me that the nature of the paper was changed by the electrolysis. To test this, I had a long message received over the Automatic Telegraph wire from Washington (this wire runs in my laboratory at Newark) and recording the same on ordinary chemically prepared paper. The speed with which the message was sent from Washington was about 800 words per minute, and the colorations forming the dots and dashes were rather faint. I then passed the strip into the electromotograph (I use this name for the want of a better one), the colorations being in a direct line with the lead point. On rotation of the drum, and when no coloration was under the lead point, the lever was carried forward by the normal friction of the paper. But the moment a coloration

passed under it, the lead point slid upon the paper as upon ice, the friction was greatly reduced, and the lever moved in an opposite direction to the rotating drum.

In this experiment, no battery was connected to the instrument. This proves that electrolysis produces a change in the nature of the paper.

I afterward found that, if a tin pen were used to receive the message from Washington, although no marks were seen, the paper appearing unchanged, yet, on passing the paper through the instrument, the movement of the lever was more marked than before. Receiving the message with a lead pen did not give so good results, although lead is the best when used direct, standing at the head of the twelve metals tried. The next is thallium. On paper moistened with aqueous solution of pyrogallie acid, tin is equal to thallium. Of all the solutions yet tested, potassic hydrate has been found to give the most marked results. The second best is sulphate of quinine. Third, hydrochlorate of rosaniline oxidized and discolored by nitrous acid.

A peculiarity of the quinine solution is that platinum shows an action, and shows it when either oxygen or hydrogen is evolved on its surface. With hydrogen the friction is lessened, as with all other metals; but with oxygen the friction is increased. This is so with all the metals subject to oxidation; but it appeared strange, at first, that it would show with a metal upon which the nascent gases had no effect.

With a lead point and a solution of the disinfectant known as bromo-chloralum, the evolution of oxygen increases the friction of the paper enormously.

Silver seldom shows a movement with any solution; and when it does, it is very weak.

Sulphuric acid shows least movement with any metal.

It appears to be a matter of indifference as to the character of the metal used for the drum, which acts as one of the decomposing electrodes. Considering that the lever will close a secondary circuit under the great pressure used upon the lever, its sensitiveness to electricity is wonderful. With a delicately constructed machine, moved by clock-work, which I have nearly finished, I have succeeded in obtaining a movement of the lever, sufficient to close the local circuit with a current (through over one million ohms, equal to 100,000 miles of telegraph wire), which was insufficient to discolor paper moistened with potassic iodide, or move an ordinary galvanometer needle. Messages may be read from the sound of the lever, when the most delicate telegraph magnet shows no current.

The uses of this instrument are many; in fact, it gives an entire new system of telegraphy.

As no secondary currents are generated, as with an electromagnet, to prevent the instant magnetization or demagnetization of the iron cores, and electrolysis being instantaneous, it is obvious that the lever will respond to signals transmitted with great rapidity. I have succeeded in transferring signals from one circuit to another at the rate of 650 words per minute; hence it may be used to repeat the rapid signals of automatic telegraphs into secondary circuits.

By attaching an ink wheel to the extremity of the lever, opposite a continuous strip of paper moved by clock-work, messages transmitted at a speed of several hundred words per minute may be recorded in ink. By attaching a local circuit to the repeating

points, and adding thereto a sounder, it may be used as a Morse relay to work long lines of telegraph.

T. A. EDISON.

Newark, N. J., August, 1874.

DUPLEX TELEGRAPHY.

[From The Operator.]

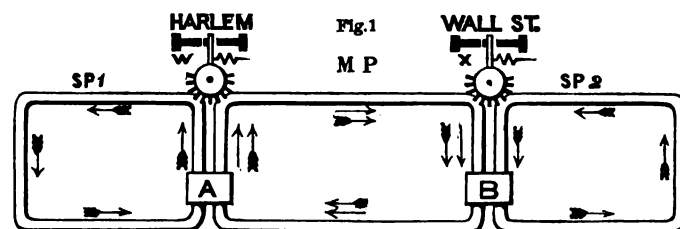
It is our aim in the following article, which is to be continued from time to time, to clearly describe, by the aid of numerous diagrams, the principles of Duplex and Quadruplex Telegraphy; using neither technical phrases nor algebraic equations, which of themselves require explanation and might not be understood.

The first attempt at sending two messages over the same wire at the same time in opposite directions was made by Dr. Gintl, an Austrian telegraph superintendent.

The main problem in that class of Duplex, by which two messages are sent over the same wire in opposite directions, is to send a current from one station by some means into the line through its own receiving relay, without causing the cores to become magnetized, or affecting it in any way whatever; but to magnetize the cores of the distant relay, untrammelled by the current sent through or around it at its own station.

This principle may be clearly illustrated if we consider that electricity travels over wires in the same manner as water travels through pipes. To work a Duplex by the transmission of water through a circuit formed of water pipes, we might arrange it as in Fig. 1.

We will suppose that this water pipe circuit is extended from Wall street to Harlem, and that A and B



were engines and reservoirs, by which a current of water of any desired amount might be made to circulate in the direction indicated by the arrows.

W and X are two water wheels provided with levers, which strike between fixed points; spiral springs are secured to these levers, to keep them against the proper point when no water passes. The object of the secondary water pipe circuits, SP 1 and SP 2, will be explained as we proceed further.

Now suppose that a stream of water was thrown into the main pipe by A, that would but half fill them, and traverses them in the direction shown by the unfeathered arrows. The action of this passing stream of water would be to slightly move both the wheels and take their levers from one fixed point to the other; when the water is stopped the levers are drawn back by the springs. So far the signal has been received at both the home and distant stations.

We will describe now how the wheel X is left to respond, and the wheel W prevented from doing so. You will notice, by referring to the diagram, that the water circuit SP 1 is so arranged upon the opposite side of the wheel, that the stream which is injected into SP 1 from A tends to turn the wheel in a direction opposite to that injected into MP; hence, if the amount and speed of the water in both the main and secondary pipes are equal, it is obvious that the wheel W will not move. As long as these balances are maintained any amount of water, traveling at any speed, may be sent from A into both circuits

without moving the wheel W. At the distant station the water moves the wheel, because none of it can circulate in the secondary circuit—SP 2.

We will now suppose that a stream of water from A is circulating in SP 1 and the main circuit, and the lever of the wheel X is moved to the left hand point, W remaining unaffected as shown before. If now the apparatus at B is so arranged that the water may be injected into the main pipe and secondary circuit in the same direction as that injected by A, the effect of the water injected in main circuit, MP, on the wheel X, is exactly balanced by that which circulates in the circuit SP 2; but it does not prevent the wheel X from being affected by water from A.

The water injected at B into MP destroys the balance at W, between MP and SP 1, and the excess throws the lever over to the left hand point. It will be seen that it is not necessary that the water should flow in opposite directions to obtain these signals.

In the electrical duplex the secondary circuits are replaced by the Rheostat or resistance box, in which are coils of fine wire so arranged that an amount of fine wire may be inserted, sufficient to retard or set up a resistance to the passage of the current equal to that offered by the line. The water wheel is replaced by a relay having double coils of wire, so that the current passing over both the line and secondary circuits in the same direction, may pass through the two coils of the relay in opposite directions, just as in the case of the water wheel, the effect is obtained by allowing the stream of water to circulate in the pipes on the opposite sides of the wheel. The current of electricity, passing through one of the coils of the relay tends to make one of the iron cores take a north magnetism, while the other takes a south; but the effect of the current passing through the other coil is just the opposite, it tending to make a north magnetism in the same core as the other coil in endeavoring to make a south; and as the two magnetism cannot exist in the same core, at the same time, none is formed. Thus we see that the current passing through the relay does not affect it, if the conditions of the main line are equal to those of the artificial line formed by the rheostat.

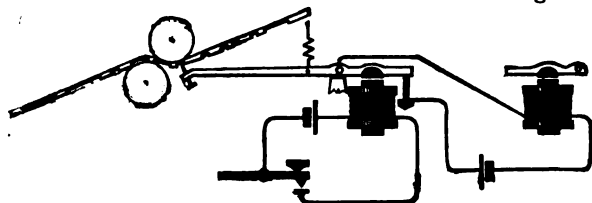
[TO BE CONTINUED.]

A NOVEL DEVICE.

[From The Operator.]

We hope by aid of the annexed diagram to clearly describe a method by which a person in the possession of any ordinary Morse Register may have the pleasure of listening to his own writing, of copying it from a sounder, with the assurance that any peculiarities which it may have will be perfectly reproduced.

To bring about this result, the first operation to be performed is to provide the register lever with repeating points, to which are connected the local circuit and sounder, as shown in the diagram.



If the embossing point be so adjusted that it will give a deep, smooth indentation, and a number of sentences are embossed upon the paper in the ordinary manner, they may be repeated by disconnecting the embossed strip and inserting the first part of it in the rolls in such a position that the indentations are in line with the embossing point.

The adjusting spring must be disconnected from its ordinary position, and placed as shown in the diagram, and a tension placed upon it sufficient to keep the embossing point against the moving paper.

The intervention of the paper will keep the repeating points apart; but whenever an indentation passes the embossing point, the thickness of the paper ceases to intervene, the local points come together, and the sounder closes; when the indentation has passed the embossing point, the full thickness of the paper again intervenes, the points separate and the sounder opens.

If 100 words were originally embossed upon the strip of paper at the rate of thirty words per minute, it may be reproduced at any speed from five to a hundred words per minute.

This machine may be useful in testing the limit of speed at which Morse writing can be copied or read, and is, probably, the only method yet devised by which a person is enabled to criticise his own writing.

DIELECTRICITY OF INSULATORS.

M. L. Boltzman has presented to the Vienna Academy of Sciences a paper on an experimental determination of the constant of dielectricity of insulating bodies. Faraday first observed the property of insulating solid bodies of being dielectric, that is, of increasing the capacity of a condenser by their presence between its two plates. Siemens, and later Gibson and Berkeley, have studied the phenomenon experimentally, while Clausius, Maxwell and Helmholtz have sought for the theoretical conditions.

Representing by $\frac{d\phi}{dN_i}$ and $\frac{d\phi}{dN_e}$ the differential ratios of the potential on the inner and outer faces of the insulator, along the normal, the quotient

$\frac{d\phi}{dN_e} : \frac{d\phi}{dN_i}$ will be the constant of dielectricity D .

Neglecting the free electricity accumulated at the borders of the plates of the condenser, and calling n the distance of the two plates, or the thickness of the electric layer, the capacity of the condenser will

be inversely proportional to $m - n + \frac{n}{D}$

The measurement of the quantity of electricity was made by a Thomson's electrometer. The condenser was charged by a battery of 18 Daniell cells. The condenser was made of the form proposed by Kohlrausch. The insulators were hard caoutchouc, paraffine, sulphur and resin; then as imperfect insulators, stearine, glass and gutta-percha. The theoretical conclusions of Helmholtz on the relation between the capacity of the condenser and the thickness of the insulating layer and plates were verified even when there were several insulating plates instead of one.

These experiments were made both with a momentary and with a continuous charge; both cases gave nearly equal capacities. From this we may conclude that the dielectric polarization is produced quite rapidly.

The author found as probable values of the constant of dielectricity the numbers for sulphur, 8.86; hardened caoutchouc, 8.15; resin, 2.55; paraffine, 2.82.

Maxwell arrived at the conclusion that the square root of the constant of dielectricity ought to equal the index of refraction. The following table shows that this law holds true quite within the limits of probable error:

	\sqrt{D} .	Index of Refraction.
Sulphur.....	1.960	2.060
Resin.....	1.597	1.568
Paraffine.....	1.538	1.536—1.516

ATMOSPHERIC TELEGRAPHY.

An interesting exhibition of telegraphic machines worked exclusively by air was recently held by Mr. Guattaris, the inventor, in the Pillar Hall of the City Terminus Hotel, Cannon street, London. A number of different instruments were on view, but the motive power in every instance was excited by the impulse given to a column of air at one end being transmitted instantaneously to the other end of the column, and taking effect upon certain mechanical arrangements, so as to produce such results as might be required. The impulse is produced at one end of a tube by the operator, and performs the mechanical work at the other end either by ringing a bell or turning a needle round a dial. Mr. Guattaris claims for his invention a superiority over others in the fact a complete message can be despatched by its means. Mr. Guattaris' instruments are only worked by a single tube, along which the air is impelled in each direction. The rapidity and precision can be made equal to the electric telegraph, the conducting tube being able to be laid under or over cover in the same manner as the ordinary telegraph. Attached to each machine is a bell and dial, and the message is transmitted by the moving of a small lever, which drives the air through a pipe to the other operator. As the lever is moved up and down, the dial, which stands where the message is destined for, registers whatever the words may be. Each dial is supplied with a needle, and, as each spurt of air presses against the works of the machine, the needle is moved exactly the number of times that the lever is pressed. Each instrument can either receive or send a message. The mechanism is not likely to become disarranged; but it appears that the invention will not transmit messages any great distance. By the aid of condensed air the inventor has succeeded in carrying a message ten miles, but without compressed air the present limit is about 400 yards. The instruments exhibited were designed for intercommunication between large coffee houses, offices, hotels and vessels. —The Telegraphic Journal.

MAGNETS.

M. Jamin describes experiments which support these three propositions: (1) The number of elementary magnetic threads, and so the quantity of magnetism a magnet may contain, depend only on the middle section. (2) The opening (*épanouissement*) of the poles of these threads, or the distribution of intensities, is regulated by the form and extent of the exterior surfaces of the magnet. (3) If the surfaces diminish, the tension increases till they become insufficient to allow of the elementary poles opening out, and a portion of the two contrary magnetisms disappear, reproducing the neutral state.

On combining 23 magnetized plates (each 0.04 inch long, 0.04 inch thick, and 2 inches broad) in a bundle, with pasteboard 0.082 inch thick between adjacent plates, each plate lost magnetism, and so the bundle, the loss of the latter being 50 per cent., which is less than in the case (first experimented on) of superposition without intervals; the loss was then 66 per cent. In this first mode all the magnetism retained was carried to the exterior; there was none, or almost none, between the plates. In the other mode the quantity remaining (151.1) was divided into two portions:—(1), 85.5, which was expanded on the exterior; and (2), 65.6, which remained in the intervals. With wider intervals the exterior magnetism is diminished, the interior increased; and gradually the plates act as if they were independent.

EMPLOYMENT is nature's physician, and is essential to human happiness.

CORRESPONDENCE.

BALTIMORE, Aug. 27, 1874.

To the Editor of the Journal of the Telegraph:

Referring to JOURNAL (No. 5, Vol. 7,) March 2d, Mr. Brown's article on the comparison of the differential and Bridge systems. I would like to ask for rule whereby he finds the resistance of the combined circuits on the differential to be 3,542 ohms, and the Bridge 2,054 ohms. As also the current flowing on the former, .0423, and on the latter, .0730 farad. Assuming the Bridge circuit to be arranged as shown in the diagram, our rules for finding the resistance of derived circuits appear to conflict in this case.

V.

Answer.—Mr. A. S. Brown, the author of the article referred to, to whom we submitted this question, replies as follows:

The combined resistance of two circuits is equal to their product divided by their sum. Applying this rule to the case of the differential circuit referred to, the result is 3,542 ohms as the resistance opposed to the current from either battery. Thus:

Resistance of two relays (500 each).....	1,000
“ line.....	6,000
“ spark coil at receiving station ...	140
	7,140
Resistance of rheostat at sending station.....	6,000
“ relay “ “	500
	6,500
7140 × 6500	
7140 + 6500	—3402.

To this add:

Resistance of spark coil at sending station.....	100
“ battery “ “	40
	140

and the total is 3542. The current in farads from the battery is found by dividing the electro-motive force of the battery (in volts) by the resistance (in ohms). 150 divided by 3542 gives .0423 as the quantity of current leaving the battery.

In the same way the current from the battery in the case of the bridge is found to be .0730 farad. That is 150 — .0730.
2054

It will appear, on inspection, that the above-named rule for finding the resistance of combined circuits is not sufficient to determine the resistance of a “bridge.” The JOURNAL of Jan. 1st, 1874, contains a communication over the signature of X. Y., in which this question is presented in the form of a problem. It furnishes an opportunity for the exercise of a little skill in mathematics which I would like to see availed of by “V.” and others.

N. Y., Sept. 3, '74.

THE USE OF EARTH WIRES ON POLES.

To the Editor of the Journal of the Telegraph:

Please allow me a small space in your valuable paper for a few words. I am a laboring man, am not opposed to necessary labor, and always obey my superiors to the letter.

An order has been issued to place earth wires or lightning rods on all Western Union telegraph poles near every telegraph office and cable crossing. Of the expense of this work I have nothing to say, but I want to ask a few questions.

1. Does the Company need protection of this kind in the Northern States to prevent injury to office

machinery, or poles, or cables? For 25 years I cannot remember, nor have I heard of any great loss by lightning, in the Northern States, of either instruments or poles.

2. Will the earth wire or lightning rod protect poles from lightning when confined to the poles with staples?

3. When the poles and cross-arms are coated with ice for weeks in Winter, will not the earth wire injure the working of the lines? FOREMAN.

Answer.—1. No office is considered to be complete in any climate without efficient arrangements to protect it from lightning. The outside lightning rod is an additional, and wise, and almost costless protection. In Great Britain every pole is thus rendered a lightning rod.

2. The lightning always seeks the easiest channel to the earth, and, even although to some the use of iron staples to connect the iron rod to the pole seems to endanger it, yet we believe it does no harm nor materially lessens the value of the rod.

3. Ice is a non-conductor and takes off no current. When melting it is no worse than rain, and not a better conductor than the rod itself. If the rod is right, the ice does no harm—even in its melting moods.

BOGUS MESSAGES.

To the Editor of the Journal of the Telegraph:

If a person should call at this office, write a message, pay the usual fee for transmitting any distance less than twenty-five miles, and wish the message delivered to a person in this place, should I be justified in receiving and delivering the same, checking myself the amount of fees? Please reply through the JOURNAL.

Answer.—No. Such a message would be a fraud, and the person aiding it should be dismissed.

Simeon J. M. Bear.—We have tried your duplex devices and find them totally inoperative, for reasons already given in our articles on the subject, and we apprehend that if you will spend as much time in testing the question with a few cells of battery and a relay, as you have in writing your objections to our criticism, you won't feel disposed to argue the question any further. Why don't you obtain and publish the opinion of the editor of the paper who printed and illustrated your description of your apparatus as to its merits?

DR. PRIESTLEY AND THE VOLTAIC PILE.

A friend of the late Dr. Priestley, Hugh Bellas, Esq., wrote: “In the Summer of 1800 I called on Dr. Priestley to return some books I had borrowed, when he told me he had just received a very curious present from Europe, which he would show me. He took me into his laboratory and pointed to a small pile of plates of silver and zinc, in alternate layers, with pieces of wet flannel interspersed, each plate about the size and form of a common playing card. A piece of small wire was inserted at the top, and another piece near the bottom, and the other ends of the wire were brought together, and there underwent decomposition. ‘Now, this is called the pile of Volta,’ said the Doctor, ‘and here is the electric fluid destroying the ends of the wire. Put the joint of your thumb to these points and you will feel a slight electric shock. You need not be afraid; it will not be severe.’ I did as he directed, and received successive slight shocks upon repeated applications to these points.” This was the first electric machine brought to America.

MR. HERRING AND THE TELEGRAPHS.

A pamphlet has been issued by Mr. Richard Herring, the patentee of a new system of printing telegraphic messages, in which the relative merits of his plan and the Morse system, now in use, are discussed. Mr. Herring's system, which has received the weighty endorsement of Mr. Latimer Clark, and Messrs. Clarke, Ford & Co., appears to have the following undoubted advantages over the Morse system of printing. The signals are more legible, and may be more accurately deciphered; the ordinary telegraph clerks can learn to work it with greater facility; it saves sixty-five or seventy-five per cent. in paper; as regards mechanical sending, the punched paper is simpler and stronger, owing to the fewer perforations; and, finally, it is peculiarly adapted for reading by sound. Professors Thomson and Jenkins, however, have reported against the instrument on the ground that it is not adapted to work on the double current method, by which two currents are used for each symbol, and that it is more complicated than the Morse instrument. To these opinions Mr. Herring takes exception, and here the matter rests for the present. With the advantages conceded, however, there appear grounds for further inquiry into the merits of the system.—*The Railway News.*

CABLE COMMUNICATION WITH JAPAN.

The U. S. steamer Tuscarora, sent out to make soundings for a cable from California to Japan, arrived at San Francisco September 2d, having been absent exactly one year. We have published from time to time the progress made in these soundings. The following is a summary of the work accomplished:

The first attempt from Cape Flattery was abandoned on account of the lateness of the season, and she made soundings on and off the coast from Cape Flattery to San Diego. From that port she struck out from Honolulu, making soundings as she went. From Honolulu she proceeded to Yokohama via Bonin Island. The deepest water found on this line was 3,287 fathoms. Two lines were started from the coast of Japan, but abandoned on account of the great depth of the water. The third line was found feasible, and a line was run to Roorile Island, one of the Aleutian group, thence run to Ounalashka, and from there to Cape Flattery. The greatest depth found on this line was five and one-fourth miles.

THE CONDUCTIVITY OF METALLIC VAPORS FOR ELECTRICITY.—The conductivity of flame for galvanic currents is known to be greatly exalted by the presence of metallic vapors, and Herwig has been led to inquire whether a gaseous layer entirely formed of such vapors would not show good conductivity even at low temperatures. He experimented with mercury, dense vapors of which can be used several hundred degrees under white heat. He finds the vapor conductor to resemble that of the voltaic rather than that of a simple metallic conductor. There is a peculiar transition resistance, which is great in comparison with the hindrances which the current finds within the vapor layer itself, so that the total resistance is in great measure independent of the extent of the vapor layer. The transition resistance is less with increased electromotive force of battery or strength of current. The vaporization in the positive mercury surface is increased by the current, an effect similar to that noticed in the Voltaic arc, in which, if the electrodes be mercury and platinum, the mercury is vaporized only when it forms the positive pole. Using a platinum point and a mercury surface, Herwig finds the resistance of the vapor greater when the mercury surface is positive.

AUTOMATIC TELEGRAPHY.

BY GEORGE B. PRESCOTT.

[From the *Scientific American*, November 5, 1870.]

Ever since the introduction of the electric telegraph as a means of communicating intelligence rapidly, efforts have been made, both in this country and in Europe, to perfect a system of automatic telegraphy by which the number of dispatches transmitted over each wire could be increased. Even in the early days of the electric telegraph, Professor Morse sought to perfect this system, which was embodied in the first telegraphic instrument devised by him in 1832, as it was also in the first model by which the new art was demonstrated in 1835. At that early period the automatic was deemed to be the only practical, if not practicable, method of insuring a perfect record. The details of this process are to be found in the earliest specifications and descriptions of the Morse invention in the Patent Office at Washington, and the instrumentalities are very fully described and illustrated by diagrams in Vail's earliest work on the telegraph, published in 1845. In this system metallic types were employed, which formed the dots and dashes of the Morse alphabet by short or long projections. These types, arranged or set up as a message, were placed in a row in rules or composing sticks, and were carried by clock-work mechanism under a lever which opened and closed an electric circuit, in accordance with the projections or depressions of the types. Experience soon suggested, however, that manipulation by hand with a simple lever possesses the advantage, of greater simplicity and economy, and it was the system adopted for practical use.

In 1848, Alexander Bain, of Edinburgh, endeavored to solve the problem of automatic telegraphy in a different manner. He prepared the messages by a hand punch, which cut longer or shorter rectangular holes in a paper band; and these holes reproduced the Morse characters by electro-chemical means, when they were drawn underneath a rubbing contact pressing on the paper. This plan also had no practical result, for on the one hand the preparation of the perforated paper band was too troublesome and slow—the time occupied in preparing the messages for transmission being many times greater than that required for sending by the Morse system—and on the other hand, the signals could not be legibly recorded, when transmitted rapidly over long lines, in consequence of the disturbing effects of static charge.

In 1854, Messrs. Siemens and Halske, of Berlin, endeavored to remedy the defects of Bain's apparatus by means of a punching apparatus constructed with three keys. The first key, when pressed down, punched a single hole in the paper band; the second, a double hole; while each key, on returning to its normal position, pushed the paper the necessary space forwards; the third key did not punch, but served only to produce spaces between letters and words. This system was introduced on the Warsaw and St. Petersburg line, but did not long remain in use, for the preparation of the paper was still found to be inconvenient and expensive, and a very carefully and frequently adjusted relay arrangement was required for the production of good work.

In 1857, Mr. John P. Humaston of Connecticut invented an instrument for perforating the paper to be employed in the transmission of messages upon the Bain plan, which it was thought by some would bring the automatic system into general use; but this apparatus, although very ingenious in design, was found too complicated, as well as too slow, for

practical use—its capacity for producing the Morse characters, when worked by an expert operator, being only about one-third as great as that of the ordinary hand key.

In 1858, Professor Wheatstone took out a patent in England for an automatic telegraph. He employed Bain's punched paper band and a three-keyed puncher, modified by employing double holes for representing the dash of the Morse alphabet, not next to one another, but over and under a middle row of holes. This third line of holes was produced by a special third punch which came into action on the depression of each of the three keys.

For sending messages, Wheatstone employed a peculiar and very ingenious apparatus provided with three needles lying in a vertical plane, and held up by light springs. These needles were severally elevated and pressed against the paper. The middle needle, in rising, always met a hole and passed through it, while the two side needles were held back by the paper, when there happened to be no hole immediately above them. The pieces carrying the side needles made battery contacts when the latter went through the paper band, while the middle needle was carried forward by a mechanical arrangement, and thereby advanced the paper a space corresponding to the distance between two of the center holes. Wheatstone at first used currents in one direction, but at a later date he employed alternate currents and polarized electromagnets. His apparatus suffers, however, independently of technical defects, from the slowness and difficulty of preparing the messages by means of the three-keyed puncher.

In 1862, Dr. Siemens of Berlin again endeavored to solve the problem of successfully operating an autographic telegraph by the method first introduced by Professor Morse, employing for this purpose an electro-magnetic type transmitter, which, it is said, enabled messages to be sent with tolerable certainty over short lines with about seven times the speed of hand sending. The instrument required, however, to be worked with more than ordinary care to secure accurate results; and it was also found that the setting up of the type took too much time, and required too numerous a staff of operators to compete successfully with the hand systems.

Dr. Siemens subsequently went back to the employment of Bain's paper band, the endeavor to construct a machine for the rapid setting and distribution of metallic types having been attended with less success than he had anticipated; but he has not yet succeeded in making the system practically useful.

In 1869, Mr. George Little, of New Jersey, patented an apparatus for preparing messages for transmission by Bain's automatic system, and a wire has recently been put up between New York and Washington for the purpose of testing the value of the apparatus. The same difficulty, however, appears to be encountered by this as with all previous attempts to utilize automatic telegraphy—too much time and expense are required to prepare dispatches for transmission. This apparatus, instead of being an advance upon those which have preceded it, seems to be among the least efficient of all, and the success of automatic telegraphy is apparently as far from realization to-day as it was a quarter of a century ago.

The theory upon which most of the experiments in automatic telegraphy have apparently proceeded is that electricity has a definite and practically instantaneous velocity, irrespective of the medium through which it is transmitted, and that all that was necessary to insure the success of the system

was to provide an apparatus by which dispatches previously prepared could be rapidly transmitted and recorded by automatic machinery.

Experiments conducted upon short lines, or upon coils of wire intended to represent long lines, seemed to justify the conclusions to which the advocates of automatic telegraphy had arrived; but when attempts were made to transmit with great rapidity upon very long lines, they were invariably attended with failure. Recent investigation has shown that electricity, instead of possessing an instantaneous velocity under all circumstances, is limited in its movements like all other forces in nature, and that its speed depends upon certain absolute conditions, among the principal of which are the length, size and quality of the conductor through which it is transmitted.

In a recent series of carefully conducted experiments with the automatic system in which chemically-prepared paper of a very sensitive nature was employed, I found that the highest rate of speed attainable through 500 miles of No. 8 iron wire did not exceed the ordinary rate of transmission by the Morse apparatus; and that the greatest speed which could be attained over a telegraph line of 250 miles in length composed of No. 8 iron wire was 100 words per minute. When the speed of the instrument was increased beyond this rate the signals were prolonged so as to run into each other and become unintelligible.

The speed of transmission increases with the square of the diameter of the wire, and diminishes with the square of its length. If a wire of the above length, but of a superior conductive capacity were employed, a proportionate increase in the rate of speed would be obtained. *Thus, for example, on the compound steel and copper wire just put up between New York and Washington, which has a conductive capacity equal to a No. 5 iron wire, or about double that of a No. 9 iron wire, intelligible signals have been transmitted at the rate of 250 words per minute. By proportionately increasing, therefore, the conductive capacity of the wire, almost any degree of rapidity may be attained in the transmission of signals; but instantaneous velocity can only be attained by a conductor of infinite dimensions.*

Supposing the claim was true, however, that there is no limit to the rate of speed at which dispatches can be transmitted by the automatic system over any of the lines now in use, what would be gained by its adoption? The value of the telegraph consists in its ability to furnish constant and instantaneous communication between all places in an accurate and reliable manner; and as the present systems are fully competent to meet all of these requirements, why is a change necessary or desirable? The fact that a much greater amount of matter may be transmitted in a given time over the same number of wires by the automatic than by the present system, offers in itself no conclusive argument in favor of a change, since there is no limit to the number of wires which may be strung between any two points in order to meet any possible increase in the traffic. The only reason, therefore, which can be adduced in favor of substituting the automatic for the hand systems is that a given amount of business may be transmitted by it at a saving in the cost of construction and maintenance of line. The superiority of the automatic system, then, if it has any, consists in its greater economy. Let us see whether it is entitled to this credit.

If the expense of constructing and maintaining a sufficient number of wires to transmit a certain amount of telegraphic correspondence was the only essential element to be considered in estimating the

fore a message can be prepared for transmission by the automatic process, it can be transmitted, copied, and placed in the messenger's hands for delivery by either of the systems now employed. No matter how good a telegraphic apparatus may be in other respects, if it fails to transmit messages promptly it is comparatively useless. The public does not care to know how many dispatches can be sent in an hour over one wire, after half a day has been consumed in preparing them for transmission. Instant and constant dispatch is what is required, and that system only will be employed which can effect it. These most essential elements of success in telegraphy are totally lacking in the automatic system, and it must, therefore, hereafter, as heretofore, prove an absolute failure for all practical purposes.

THE TELEGRAPHERS' MUTUAL BENEFIT ASSOCIATION.

ASSESSMENTS 67 AND 68, ISSUED SEPT. 14, 1874.

DEATH OF C. B. MATHEWS AND A. G. MARTIN.

C. B. Mathews (Certificate No. 2098, issued Aug. 15, 1873) died at Chacahoula, La., August 5, 1874, of small-pox.

A. G. Martin (Certificate No. 376, issued Dec. 4, 1868) died at Canoe Station, Ala., of bilious fever.

Two dollars are due on above assessments from members whose certificates are dated previous to August 5th, 1874; one dollar from those holding certificates dated between Aug. 5th and Aug. 26th, 1874.

ACKNOWLEDGMENT OF RECEIPTS FOR ASSESSMENT NO. 66, UP TO AND INCLUDING SEPT. 11, 1874.

5, 6, 23, 25, 28, 54, 56, 58, 61, 67, 72, 80, 90, 93, 99, 103, 108, 114, 129, 134, 136, 139, 141, 142, 144, 146, 152, 175, 176, 177, 188, 201, 202, 235, 240, 244, 245, 247, 257, 278, 279, 281, 282, 283, 285, 286, 319, 328, 344, 351, 360, 367, 371, 372, 376, 379, 381, 391, 392, 393, 401, 405, 413, 414, 416, 425, 426, 430, 431, 456, 463, 478, 510, 520, 526, 533, 548, 554, 561, 576, 577, 594, 604, 618, 622, 672, 678, 680, 690, 715, 729, 730, 733, 735, 750, 751, 756, 769, 787, 791, 825, 830, 831, 832, 843, 855, 859, 871, 874, 880, 883, 886, 901, 927, 939, 943, 991, 992, 995, 998, 1034, 1038, 1040, 1047, 1054, 1055, 1058, 1061, 1068, 1090, 1099, 1102, 1173, 1193, 1194, 1196, 1200, 1241, 1251, 1266, 1274, 1277, 1292, 1307, 1308, 1309, 1311, 1312, 1313, 1314, 1315, 1317, 1318, 1319, 1330, 1331, 1332, 1336, 1371, 1372, 1385, 1389, 1390, 1391, 1402, 1403, 1404, 1410, 1412, 1423, 1437, 1438, 1440, 1453, 1482, 1485, 1486, 1500, 1501, 1511, 1515, 1522, 1537, 1569, 1576, 1580, 1582, 1591, 1593, 1594, 1623, 1625, 1626, 1632, 1634, 1707, 1721, 1728, 1732, 1736, 1745, 1790, 1791, 1795, 1796, 1797, 1804, 1810, 1817, 1818, 1833, 1824, 1847, 1869, 1874, 1906, 1911, 1913, 1914, 1931, 1933, 1951, 1969, 1965, 1994, 1999, 2000, 2001, 2024, 2025, 2027, 2036, 2040, 2044, 2048, 2069, 2063, 2069, 2113, 2118, 2119, 2123, 2125, 2127, 2132, 2173, 2195, 2196, 2202, 2212, 2214, 2216, 2233, 2234, 2236, 2232, 2240, 2243, 2261.

ACKNOWLEDGMENT OF RECEIPTS FOR ASSESSMENT NO. 65, UP TO AND INCLUDING SEPT. 11, 1874.

27, 178, 237, 238, 242, 246, 253, 273, 288, 294, 347, 351, 396, 451, 453, 455, 457, 692, 766, 803, 804, 952, 1134, 1135, 1136, 1144, 1153, 1207, 1267, 1273, 1450, 1553, 1609, 1631, 1715, 1716, 1722, 1731, 1773, 1786, 1941, 1974, 1975, 1976, 2037, 2063, 2066, 2061, 2123, 2177, 2182, 63.—1182, 2127, 2194, 2199.

Members of the Association who look to the JOURNAL OF THE TELEGRAPH for receipt of assessments paid, will please take notice, that an acknowledgement of the receipt of one assessment should be taken as a receipt for all previous assessments.

THE QUARTERLY DIVIDEND.

At a meeting of the Directors of the Western Union Telegraph Company, held at the Executive Office of the Company on Wednesday, September 2, a dividend of two per cent. was declared, payable October 15th, for the quarter ending September 30th.

TARIFF BUREAU. SEMI-MONTHLY CIRCULAR.

EXECUTIVE OFFICE,
WESTERN UNION TELEGRAPH COMPANY,
145 Broadway, New York, September 15, 1874.

To all offices on W. U. Lines:

The following changes and additions have been made since the date of the last circular:

GENERAL INFORMATION.

Fort Payne, Ala., closed.
Greensboro, Ala., closed.
Green Pond, Ala., closed.
Haysville, Ala., closed.
Wetumpka, Ala., reopened.
Allen Springs, Cal., closed.
La Bran, Col., changed to Canon City.
Nederland, Col., is in Boulder Co. instead of Bourbon Co., as given in JOURNAL, Aug. 15, 1874.

Hereafter the "tariff for other lines" to Navy Yard, near Pensacola, Fla., will be 50 and 5 from Pensacola, Fla., instead of 100 and 10 from Pollard, Ala. Check Pensacola.

Hanson, Ky., closed.
Johnson, Ky., closed.
Morton's, Ky., closed.
301 Petersburg, Christian Co., Ky., closed.
Old Orchard Beach, Me., closed.
Fort Point, Me., closed.
Pigeon Cove, Mass., closed.

Messages for West Harwich, Mass., should be checked to Dennisport, Mass., from which office they will be delivered without charge.

Toombsville, Miss., re-opened as an other line office; "tariff for other lines" 25 and 2 from Meridian, Miss.

Hereafter the "tariff for other lines" from Concord, N. H., to Bristol and Suncook, N. H., will be 30 2 and 25 2 respectively.

Boar's Head, N. H., closed.
Farragut House, N. H., closed.
Sea View House, N. H., closed.
Somer's Point, N. J., closed.

Messages for Woodbridge, N. J., (office now closed) are delivered from Rahway, N. J. Charges for delivery \$1.00 during the day, and \$2.00 at night and on Sunday.

Hereafter messages for the following other line offices in Ohio will be sent to Ashtabula, O., instead of Youngstown, as heretofore. "Tariff for other lines," as given with the name of the offices:

Ashtabula Harbor, O. 25 2 New Lyme, O. 35 2
Austintown, O. 35 2 North Bristol, O. 45 3
Bloomfield, Trumbull Co., O. 45 3 Rock Creek, O. 35 2

Ava, O., reopened, square 181.
Glenwood, O., reopened, square 181.

Bark Lake, Ont., closed.

Buena Vista, Butler Co., Pa., re-opened, square 140, check Petrolia City.

Cresson Springs, Pa., closed.

Monterey Springs, Franklin Co., Pa., closed. Business will hereafter be checked to Blue Ridge.

Curleville, Pa., closed.

Street Road, Pa., closed.

Havelock, Que., changed to Bryson.

Bon Aqua Sta., Tenn., closed.

Gallatin, Tenn., closed.

Rogersville Junc., Tenn., closed.

City Point, Va., closed.

Jordon's, White Sulphur Springs, Va., closed.

Messages for Pennaboro, W. Va., should be checked to Cornwallis, W. Va., at Cornwallis' rate.

NEW OFFICES.

* Woodstock, Tuscaloosa,
Co., Ala. 40 3 342 Meridian, Miss.
* Kelseyville, Cal. 50 25+ Colusa.
Canon City, Col. (formerly La Bran), 50c. more than Pueblo.
557 Longmont, Col.
* Camp McDermitt, Idaho. 100 50+ Winnemucca Nev.
* Silver City, Idaho. 150 50+ " "
* Summit Springs, Idaho. 125 50+ " "

† For each additional five or fraction of five words.

329 Stonefort, Ill.

327 Weston, Ill.

* Muldraugh, Ky. 35 2 268 Louisville.

* U. S. Military Asylum,

Togus, Me. 25 2 11 Augusta.

* Barrett's Junc., Mass. 22 2 32 Springfield.

12 Dennisport, Mass.

* Enfield, Mass. 30 2 32 Springfield.

* Indian Orchard, Mass. 25 2 32 "

* North Dana, Mass. 30 2 32 "

* Casnovia, Mich. 35 2 269 Grand Rapids.
* Newaygo, " 50 3 269 "
* Sparta, " 30 2 269 "
* Braasher Falls, N. Y. 25 1 35 Montreal Junc., Que.,
Mont. Co.

* Lewiston, N. Y. 35 1 120 Buffalo, Mont. Co.

* Pierpont, N. Y. 35 1 74 Oswego, "

* Three Mile Bay, N. Y. 25 1 57 Utica, "

* Bristol Centre, O. 45 3 169 Ashtabula.

* Orwell, " 35 2 169 "

* Rome, " 35 2 169 "

* Avonmore, Ont.

* Berwick, "

* Crysler, "

* Easton's Corners, Ont.

* Lunenburg, "

* Milleroches, "

* Morewood, "

* Newington, "

* North Winchester, Ont.

* Osnabrock Centre, Ont.

* South Finch, Ont.

* Wheatley, Ont.

* Wales, Ont.

103 Blue Ridge, Pa.

* Becancour Village, Que.

* Bryson, Que.

* Gentilly, Que.

* Leclercville, Que.

* St Pierre Les Becquets, Que.

TO OFFICES HAVING "SHEET C."

The square for Rusk, Wis., is 32 instead of 23, as given in JOURNAL of Aug. 1, 1874.

ATLANTIC CABLE BUSINESS.

We are notified that the Hong Kong and Amoy cable is broken. Messages for Japan, and for Amoy and Shanghai in China, will, until further notice, be forwarded via the only remaining route, viz: "via Siberia." No indication of route for messages to Japan; and Amoy and Shanghai in China is therefore at present necessary.

WILLIAM ORTON, *President.*

TRANSFER SERVICE.

EXECUTIVE OFFICE,
NEW YORK, Sept. 8, 1874. }

To all Transfer Offices:

On and after Oct. 1st, transfers of gold coin will be made only:

1. Between Offices in the Pacific Division.
2. Between "Offices specially authorized;" and
3. Between Offices in the Pacific Division and "Offices specially authorized."

All other Money Order Offices are hereby instructed to refuse coin transfers on and after the date specified.

GEO. H. MUMFORD,
Vice-President.

EXECUTIVE OFFICE,
NEW YORK, Sept. 7, 1874. }

On and after September 21st, Rahway, N. J., will be added to the list of money order offices in D. H. Bates' district.

Cape May and Atlantic City have been discontinued as transfer offices.

GEO. H. MUMFORD,
Vice-President.

BORN.

CONGDON.—At Pekin, Ill., Aug. 20, 1874, to Wm. J. Congdon, Chief Operator W. U. Tel. Office, a son.

KERR.—At Hummelstown, Pa., Aug. 30, 1874, to Jos. D. Kerr, Manager W. U. Tel. Office, a son.

WILSON.—At Bridgeville, Aug. 23, 1874, to E. L. Wilson, Manager W. U. Tel. Office, a son.

DIED.

MASTEN.—At Rathboneville, N. Y., Aug. 31, 1874, Ella C., little daughter of John H. Masten, Agent and Operator, aged 21 months.

Journal of the Telegraph.

This Journal is issued on the 1st and 15th of each month. Its circulation is over 8,000. It goes to every State, Territory and Province on the Continent. It has become a necessity, and is always welcomed as a friend. No better medium for advertising exists.

TERMS:

TWO DOLLARS PER ANNUM IN ADVANCE.

Address—

JOURNAL OF THE TELEGRAPH,

Western Union Telegraph Company,

145 Broadway, New York.

NEW YORK, SEPTEMBER 15, 1874.

We have among our readers an extensive circle of scientists, to whom the discussion of subjects connected with electrical science is entertaining and useful. In the absence of any association for the consideration of such subjects, no better place for this purpose than the columns of the JOURNAL can be found, and we should be glad to see them more freely used. We are led to these remarks by a communication in another column, calling attention to a problem published in the JOURNAL of January 1st, which remains unanswered. It is not to be supposed that there are none among our readers able to solve the problem presented. Assuming that it has escaped notice, we now invite attention to it and will be pleased to publish the solution when received.

THE JOURNAL of February 1st, 1874, contained the following notice from the Treasurer of the Company, in reference to the reports and remittances upon cable business. The requirements of the rule and the request of the Treasurer seem to be generally disregarded. It is a matter of considerable importance in the transaction of the Company's business, that these reports should be properly rendered, and we again call the attention of managers of offices to this fact:

"Managers of offices are requested to observe the requirements of Rule 91, in respect to reports and remittances. Great inconvenience is occasioned by neglect to report the dates of messages sent. When remittance is made in currency, the amount of tariff in gold should always be stated, as well as the amount of currency received.

R. H. ROCHESTER, Treasurer."

The new tariff book is now ready, and may be had by requisition. In form this book is square 16mo., and is the most comprehensive compilation of rates that has yet been issued.

FAST SYSTEMS OF TELEGRAPHY.

Our present issue contains a paper on Automatic Telegraphy, by George B. Prescott, copied from the *Scientific American* of November 5, 1870, and an article on multiple transmission from *Sabine's Electric Telegraph*, 1869, giving an account of the various attempts made in Europe to produce a practical system for the transmission of two messages in one direction on one wire at the same time.

Automatic telegraphy in this country has undergone no material change during the past five years, the line between New York and Washington, which was completed in 1869, still remaining the only one upon which dispatches are transmitted by the automatic process. Of the 8,284 instruments used upon the English Government lines, only 98 are automatic, and these are principally employed in the transmission of press news, where they are said to perform satisfactory service, because the same reports are sent to a considerable number of places, and the punched paper is made to do service upon a large number of circuits by being successively passed through the transmitting instruments of each. In this country, where the various press associations have their own agents, and each prepares a separate report, this plan would not be of any practical value. Nowhere in Europe, outside of England, is the automatic system used, except to a very limited extent in Prussia, and there only for the transmission of weather reports. Indeed, the system is regarded as of very little practical value anywhere. Even in England, where the Government has long owned the Wheatstone patents, they use them upon only a few circuits, while they have duplexed over sixty thousand miles of wire by Stearns' invention. An exclusive automatic system for the operation of a telegraph is an absurdity which no reasonably sane man would advocate. People who wish to send telegrams promptly, are not going to wait for them to be first punched, and then transmitted, and then slowly and laboriously copied out by hand, thus undergoing three separate processes, when they can be sent by a system which performs the whole process of transmission and copying simultaneously. Certain kinds of telegraphic traffic admits of delay, and is sent at reduced rates. It may be that some system of automatic apparatus may be devised which can be advantageously used as an auxiliary to the present system for handling this kind of business, but if so, it must be at least a self-recording letter printing instrument, requiring no subsequent expenditure of labor and time in copying.

Mr. G. M. Phelps, the Superintendent of the Western Union Telegraph Company's manufactory, who is well known as one of the most distinguished inventors of telegraph apparatus, as well as skillful mechanics in the country, has been for some time engaged upon an automatic printing instrument, which is now nearly completed, and bids fair to be altogether the simplest, most economical and time-saving automatic system thus far invented. The machine will be run by an electro-motor, at a trifling

expense for battery power; the paper will be prepared for transmission at the rate of 60 to 80 words per minute; the dispatches thus prepared will be automatically transmitted at the rate of at least 100 words per minute, upon circuits of 250 miles, and simultaneously printed upon the receiving instrument in plain Roman letters. There are many other advantages in this over any other automatic plan hitherto devised, which we cannot now take time to describe, but we will mention one peculiarity of paramount importance, which is that the prepared slip contains over each perforation the printed letter which it represents, so that the perforated paper copy can be quickly compared, with the original messages and all errors in composition provided against.

During the past few months Mr. George B. Prescott and Mr. Thomas A. Edison have been industriously at work upon their new Quadruplex Telegraph, and having finally overcome all difficulties in the way of its practical success, it will be at once put in operation between all important places upon the Western Union lines. As an evidence of the great value it will be to the Company in the successful handling of its immense traffic, we will mention that 402 messages taken at random from the current business of the day, were sent over a single wire three hundred miles long, and copied in a good legible hand in one hour and a half. Four operators were employed in sending, and four in receiving. The messages were of average length, and fairly represented the ordinary correspondence of the lines. The operators were all first-class, and worked as fast as they could, one of them receiving 90 messages in an hour. They could not, of course, keep up this speed all day, but they demonstrated the fact that they could do fully as much business on one wire with the Quadruplex as they could on four wires with the ordinary Morse apparatus. With a system which can quadruple the capacity of all the main arteries of communication which the Company possesses, what can stand in the way of its growth and prosperity? And in view of this fact, of what possible value are any of the automatic systems which are so noisily and persistently kept for sale before an unappreciative public?

Notwithstanding the fact that Robert Sabine, one of the first electricians and civil engineers in Europe, announced in 1869 that "the systems of telegraphing in opposite directions, and of telegraphing in the same direction more than one message at a time, must be looked upon as little more than feats of intellectual gymnastics—very beautiful in their way, but quite useless in a practical point of view", they have both become actual practical realities.

As Stearns took an old and useless scientific toy, upon which half a score of the best electricians in the world had in vain devoted their utmost skill to turn to any account as a working apparatus, and by a series of inventions, as simple as they were ingenious, turned it into a practical and useful system for the simultaneous

transmission of two messages in opposite directions on one wire, so the hitherto apparently impossible problem of transmitting two messages simultaneously in the same direction upon one wire has by skill and perseverance not only been practically solved, but the still greater feat of transmitting four messages over one wire at the same time at full speed, is an established and practical fact.

The quadruplex, like the duplex, is worked by the ordinary Morse operators, and therefore requires no change in the working force of an office, thus insuring the same simplicity and economy of manipulation which has always characterized the Western Union system of telegraphy. It may be used as a single Morse wire, or as two Morse wires, which, unlike the ordinary duplex, are perfectly independent of each other, the third and fourth sides being used to interrupt the sending operator; or it may be used as three or four wires, in which cases breaking is done through the sending operator, as in the duplex. When it is worked as two wires, way stations may be inserted, who can send and receive on either side.

CIRCULAR TO THE STOCKHOLDERS.

The following circular has been issued to the stockholders of the Western Union Telegraph Company:

EXECUTIVE OFFICE
WESTERN UNION TELEGRAPH COMPANY, }
NEW YORK, September 4th, 1874.

Notice is hereby given, that the Annual Meeting of the Stockholders of The Western Union Telegraph Company will be held at the office of the Company, in the City of New York, on Wednesday, October 14th, 1874, at twelve o'clock, noon.

Stockholders may vote at the meeting in person or by proxy. It is desirable that the stock of the Company be generally represented at each annual meeting, and, in pursuance of the usual custom, a proxy is enclosed herewith. If not able to be present, please sign and return the same to the Secretary.

A quarterly dividend of two per cent. on the capital stock of the Company has been declared from the net earnings of the three months ending September 30th, payable at the office of the Treasurer, on and after the 15th day of October next, to stockholders of record at the close of business on the 19th day of September. The Transfer Books will close on the afternoon of the 19th inst., and will be opened on the morning of the 16th October.

GEO. H. MUMFORD, *Secretary.*

MARINE NEWS REPORTS.

The following circular has been issued by the Gold and Stock Telegraph Company:

To the Underwriters, Ship Owners, and those interested in Marine News:

The Marine News, which has heretofore been served to those interested therein in the City of New York, has been mainly collected by the Agents of the Western Union Telegraph Company, and has been transmitted exclusively by their lines. The sale and distribution of this News has, however, been carried on for private gain by parties over whom the Western Union Company have had no control; and for the grounds of the numerous and long continued complaints which have been made concerning this service the Telegraph Company has not been responsible.

Failing to secure such a control of the Western

Union wires as would enable the venders of Marine News to handle it so as to best promote their private interests, a scheme was recently inaugurated for the establishment of a new line to Sandy Hook, ostensibly for the accommodation of underwriters and shipowners, but really to enable a manipulation of Marine News to be practiced by its Managers, which could not be accomplished in connection with the Western Union Company.

In view of these facts, and for the better accommodation of the public, arrangements have been made whereby the Gold and Stock Telegraph Company will immediately add to their business in New York and other principal cities, a department for the collection and distribution of Marine and other News interesting to Shipowners, Underwriters and Commercial men generally.

The vast facilities of the Western Union Company, and its connections in Canada and Mexico, and by the Atlantic and Cuba cables, will be employed more intelligently and systematically than ever before in collecting this News, which will be delivered to customers at their residences and places of business by the new Fast Printing Telegraph Instruments of the Gold and Stock Company.

It has also been arranged to open a News Room in the light and convenient basement of the Cotton Exchange, in connection with the Western Union Telegraph Office, which has direct wires to all the principal cities. All important Marine News will be posted on the Bulletin Boards of the News Room as soon as received, and all information obtainable will be furnished the customers of the Gold and Stock Telegraph Company by the Agents in charge.

At Sandy Hook the facilities will be increased. In short, the experience, skill and unparalleled facilities of the Western Union and Gold and Stock Companies combined, will be availed of to produce a better service than has heretofore been provided, or can be provided by any or all other agencies.

MARSHALL LEFFERTS, *President.*

A BIG CORPORATION.

One of the finest buildings to be found in New York is that in process of erection by the Western Union Telegraph Co., on the corner of Dey street and Broadway. This immense structure will be completed at a cost of \$1,700,000, and will be ready for occupancy about the first of January. The building is nine stories high, and will be entirely occupied by the Company, with the exception of two stories, which will be rented. The battery room alone will occupy nearly the whole of one story; then the President's room and the rooms of the other officers will fill up the rest of the building. Few persons have any idea of the immensity of this corporation. It owns 173,517 miles of wire, 5,955 offices, and has 9,190 employés. Last year it transmitted 14,456,832 messages, at an average of fifty-four cents a message. The Company has been putting up new wire at the rate of 20,000 miles a year, for the past three years. George B. Prescott, Electrician of the Company, and Thomas A. Edison, inventor of the automatic telegraph, have invented a process by which four messages can be sent over one wire at the same time. This invention will prove a great saving to the Company, and is almost as wonderful as Morse's. This Company has been using \$150,000 worth of lightning a year, but with their new batteries they save \$50,000. Mr. Prescott has just sent to England for batteries that make electricity by steam. This novel idea will save about \$50,000 more, if it prove a success.

There are nearly two hundred messenger boys employed at the main office in New York, and they

are never idle a moment. A number of tailors are constantly at work repairing the boys' uniforms and making them over for new hands. It was a good idea, that of putting these messenger boys in uniforms, and has been followed by the other companies, and by almost all corporations that employ a large number of boys.—*New York Bureau of Correspondence.*

POSTAL TELEGRAPH.

For the past eight years there has been a fierce war waging between the counsel of the Western Union Telegraph Company and the counsel for the United States Government on the subject of postal telegraph. In England and other European countries all the telegraph lines are owned by the Government, and instead of making money they run millions of dollars behind every year. To be sure, if our Government held the wires, we might be able to send messages at lower rates, but that would only be robbing Peter to pay Paul, for the whole country would then be taxed for its support. It is well enough that we should be taxed for the Post-Office Department, for that is a necessity, but telegraphing is a luxury. Everybody sends letters, but comparatively few send telegrams. The reason that the Government would lose money by postal telegraphy is simply this: There would be too much wire-pulling. Superintendents of telegraph offices cannot be appointed like postmasters—without having any qualifications for their business. Politicians would get their fingers into the pie. Clerks and operators would be appointed by favoritism, and the number would not only be increased, but both time and money would be wasted. It stands to reason that a private corporation is going to look closer after its own interests than a government whose administration is constantly changing. This at least is the view of telegraph people.—*New York Bureau of Correspondence.*

We print in this number of the JOURNAL the first of a series of original articles on Duplex and Quadruplex Telegraphy, taken from the columns of *The Operator*, a journal devoted to telegraphers, which has been published in this city for a year past, but which has not, until lately, entered the field of science.

If the articles which we reprint, as well as the other original matter which appeared in its first scientific number, are to be taken as a criterion for the future, it cannot fail to receive a liberal patronage from the telegraphic fraternity. We cordially extend to it the right hand of fellowship, and wish it all manner of success.

A TELEGRAPHIC BLUNDER AND WHAT CAME OF IT.

Mr. Gibson, solicitor, writes to the *Times* that at the recent Assizes for Kent it became his duty to telegraph to a plaintiff and witnesses to attend the court on a particular day, and instructing them to travel by the "seven-thirty" train. The action was for breach of promise of marriage, and when the case was called on the plaintiff and her principal witness were absent. The case was so fortified by other evidence that counsel advised it should proceed, and the plaintiff obtained some damages, but not without strong and damaging observations by defendant's counsel upon the absence of the plaintiff and her family witnesses. A few minutes before the jury gave their verdict (about one o'clock), the plaintiff and her father came into Court, and then produced a telegram directing them to travel by the "eleven-thirty" train—just four hours after the time appointed by my telegram. On inquiry it turns out

that some one in the Post-office employ (elsewhere than at that town, though the authorities do not say where) had made the gross blunder of writing "eleven" for "seven." The Post-office authorities write to me (says Mr. Gibson) and express their great regret, and assure me that they have taken "serious notice" of the blunder, the force and effect of which "serious notice" will be appreciated at once when I state that their letter is a lithographed form, the date only inserted in writing; from which I infer it to be obvious that discreditable mistakes are of constant concurrence, and the alleged "serious notice" a mere courteous expression, utterly without meaning or result. One of the jurymen, after the trial, was heard to say that they should have given nearly double the damages if the plaintiff and her father had been called. A telegraph company would have been liable to pay damages; but where is the remedy against the Post-office?—*Dublin Freeman, Aug. 15.*

TELEGRAPH SECURITIES.

Mr. William Abbott, of London, in his last monthly circular, has the following remarks with respect to telegraph securities:

A noticeable feature this month has been the further advance in value of the Globe shares, both preference and ordinary, which again demonstrates with what favor this amalgamation of telegraph property is regarded by investors. This continued improvement in the market value for these shares will doubtless stimulate the desire for a wider extension of this principle of consolidation. As regards Anglo-American stock, the scare of the so-called "Direct United States Cable" appears to be gradually subsiding, fresh investors taking the place of those who have sacrificed their stock at low prices. It is anticipated that by the first week of next month the Great Eastern will have completed the new line for the Anglo Company, which will then possess four cables in perfect order. So much has been said of the watering of the Anglo stock at the time of the amalgamation with the French Atlantic Company, that it may be as well to repeat that this last addition to the property of the Company will not involve any increase in the capital, and that on the repair of the 1865 cable next year the Company will have five cables at work, with established connections in all parts of the world. The decline in the traffic for July over the Eastern system is to be accounted for by the interruption of the two lines to Lisbon for a period of ten days; but for this exceptional occurrence a large increase would no doubt have been shown. The delay in the completion by the Central American Company of the Cayenne-Demerara section is a disappointment, as it puts off for a time the connection between North and South America. Excepting in the loss of anticipated new traffic, the West India and Panama Company are in no way affected, their contract with the Central American Company not taking effect until the line can be handed over to them in perfect working order. The steamship Hooper will reach England in a few days, when no doubt the contractors will be able to explain the cause of the failure in the cable. The traffic of the Cuba Company, just published, is very satisfactory. From recent advices there is evidently no lack of telegraphic development going on in all parts of the world. From Japan we learn that heavy cables of English manufacture are being submerged by the Japanese Government, and from the Argentine Confederation the Minister of the Interior reports that the Republic has now 4,146 miles of telegraph open for traffic. The advantages of an extended system of internal telegraphs have long been admitted by the authorities of the Argentine Republic,

and this official statement of the progress made will be especially welcome and encouraging at the present time to the holders of Brazilian Submarine and other cable property connected with South America, as internal telegraphs are feeders to and provide business for the submarine lines. Besides this, what has been done in the River Plate will no doubt also be accomplished by Brazil.

The proprietors of submarine telegraph property will no doubt have noticed with considerable interest that the question of the Government purchase of the British ocean telegraphs is likely to come into prominence under auspices of some influence. Mr. Reed, M. P., late constructor of the navy, has this week placed upon the notice paper of the House of Commons a motion which he will submit next session, "to call attention to the desirability of bringing British ocean telegraph lines under united and responsible public management, and in closer coöperation with the telegraphic systems of the Continent, and that a select committee be appointed to inquire and report upon the subject." There may be many and various opinions as to the policy of the purchase of these properties by the Government. International as well as imperial interests are involved in it; but there is no doubt it is high time that the question should be impartially and thoroughly investigated thus early, as delay only adds still more to the difficulties surrounding it.

THE TELEGRAPH IN CHINA.—The telegraph line between Foo Chow and Pagoda anchorage is opened and in full working order. The line is about eight miles in length. It runs for more than two miles on the right bank of the river. The entire line was constructed in twelve days, at an expense of about \$4,000. It is worked on the Morse system. The mandarins of the province have examined the working of the line, and are highly pleased.

THE TELEGRAPH IN JAPAN.—There has been talk of the Mikado formally and ceremoniously opening the telegraph system, which, although now in operation for some years, has not yet been so honored. It was spoken of as His Majesty's wish that some such opening should take place a long time ago, but constant interruption on the main line between Yokohama and Nagasaki has interfered with it.

THE SOUTH AMERICA AND WEST INDIA CABLES.—Mr. R. T. Brown, Manager of the West India and Panama Telegraph Company's cables, has arrived at St. Thomas from Para, where he left the Brazilian cable expedition. He has proceeded to Jamaica, but will return to meet the cable steamer Hooper with the cable to connect Cayenne with Demarara.

A GRAND ball was given at Rio de Janeiro, Brazil, on the 18th of July, in honor of the establishment of telegraphic communication with Europe. Their Majesties and about 1,500 persons were present. The Emperor has decorated various gentlemen connected with the Transatlantic Cable Company.

WITH reference to the Barcelona-Marseilles Cable, it is notified that the number of messages (of twenty words) passing over the line for the month ending July 31, 1874, was 6,882 against 5,451 for June.

VICE-CHANCELLOR MALIUS has authorized a further dividend of one shilling in the pound to the creditors of the Great Oceanic Telegraph, making, with former payments, sixteen shillings in the pound.

A DIVIDEND for the six months ending January 30th, 1874, at the rate of 15½ per cent., less income tax, has been declared by the Submarine Telegraph Company.

Red Star Line.

Appointed to carry the Belgian and United States Mails.

The following Steamers are appointed to sail

FOR ANTWERP.

From Philadelphia.	From New York.
VADERLAND, Sept. 23.	COLINA, Sept. 11.
NEDEERLAND, Oct. 17.	SWITZERLAND, Oct. 5.

FROM ANTWERP.

For Philadelphia.	For New York.
NEDEERLAND, Sept. 23.	SWITZERLAND, Sept. 11.
VADERLAND, Oct. 17.	COLINA, Oct. 5.

PRICES OF PASSAGE IN CURRENCY.

First Cabin, \$90. Second Cabin, \$60. Steerage and Intermediate tickets to and from all points at the lowest rates.

Passenger accommodations for all classes unsurpassed. Ample attendance is provided. Every steamer carries a surgeon and stewardess.

Through tickets and through Bills of Lading issued between all prominent points.

For passage, rates of freight, and other information, apply to GEO. W. COLTON, Agent, 42 Broad Street, N. Y. JOHN McDONALD, Passenger Agent, 8 Battery Place, N. Y.

PETER WRIGHT & SONS, Gen'l Ag'ts,

307 Walnut Street, Philadelphia.

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AMERICAN LINE.

The American Steamship Company of Philadelphia.

Weekly Mail Steamship service between

PHILADELPHIA AND LIVERPOOL,

CALLING AT QUEENSTOWN,

Sailing every Thursday from Philadelphia, and

Sailing every Wednesday from Liverpool.

The following Steamers are appointed to sail from Philadelphia.

*ABBOTSFORD, Sept. 17.	OHIO, Oct. 8.
PENNSYLVANIA, Sept. 24.	*KENILWORTH, Oct. 15.
ILLINOIS, Oct. 1.	INDIANA, Oct. 22.

PRICES OF PASSAGE IN CURRENCY.

Cabin \$75 to \$100 according to accommodations. Steerage and Intermediate tickets to and from all points at the lowest rates.

Steamers marked with a STAR do not carry intermediate.

Passenger accommodations for all classes unsurpassed. Ample attendance is provided. Every Steamer carries a surgeon and stewardess.

These Steamers are supplied with Life-Rafts in addition to the usual Life-Boats and Life-Preservers.

Through tickets and through Bills of Lading issued between all prominent points.

For passage, rates of freight and other information apply to GEO. W. COLTON, Agent, 42 Broad Street, N. Y. JOHN McDONALD, Passenger Agent, 8 Battery Place, N. Y.

PETER WRIGHT & SONS, General Agents,

307 Walnut Street, Philadelphia.

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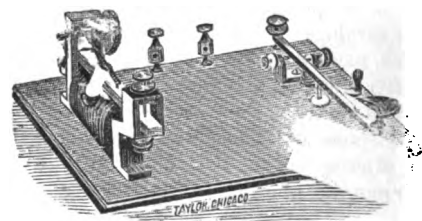
Liverpool.

N. & J. Cummins & Bros.,

Queenstown.

THE AMATEUR'S Telegraph Apparatus.

(PATENTED APRIL 16TH, 1872.)



With this Instrument is furnished

A Complete Outfit for the Student,

INCLUDING

BATTERY,

CHEMICALS, and
MANUAL.

There are several thousand in use.

PRICES:

Complete Outfit	\$7 00
Sounder and Key	6 00
" " with Out-Out and Lightning Arrestor	7 00
Sounder No. 3	4 00
" No. 4	3 00
Key No. 4	4 00

GEO. H. BLISS & CO.,

41 THIRD AVENUE,

CHICAGO, ILL.

JOURNAL OF THE TELEGRAPH.

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WHOLE NO. 166.

THE HUGHES PRINTING TELEGRAPH.

[Translated from Schellen's *Elektromagnetische Telegraph.*]

In order to overcome the principal objection in the systems of printing telegraph hitherto in use, viz : that the type wheel containing the letters of the alphabet, and, with it, the whole machinery, had to be brought to a stand-still for the purpose of printing each letter, Mr. Hughes conceived the idea of causing the type wheel to revolve continuously and rapidly, with as uniform a movement as possible, and effect the printing during the motion. At first sight this would appear to be impossible, because, firstly, the often repeated pressing of the slip of paper against the type wheel would cause the latter to be retarded in its motion at each pressure, and thus utterly de-

wheel which must occur from the repeated pressure of the paper, he constructed on the axis of the type wheel a so-called correction wheel, for the purpose of putting the type wheel to its proper position after the impression has been taken. Owing to the fact that he fixes the type wheel on the last but one axis of the wheel work, but the parts which effect the pressing of the slip of paper against the type wheel on the last axis, he succeeds in making the latter operate in $\frac{1}{15}$ part of a second, while the type wheel requires $\frac{1}{4}$ of a second to make a complete revolution.

Of course, in order to obtain such results a very powerful wheel-work and heavy weight is required, and also a very energetic action of electrical power.

means of a set of twenty-eight keys (Figure 2) twenty-six of which are for the letters of the alphabet, and one each for a stop or period and a blank to separate the different words. Each key, K, (Figure 3), presses on a two-limbed arm of a lever, K' which has its center of motion at K'', and ends at a pin k, which is turned vertically upwards, drawn downwards and somewhat sideways by means of a spiral spring (Figure 4), to which it is connected by means of a link. These twenty-eight pins, k, are placed in a circular order round the vertical axis Q, inside a round box A; the levers K' consequently are constructed and bent in a different way, in order that each of them may operate on the corresponding pin k at the pressing of its own key

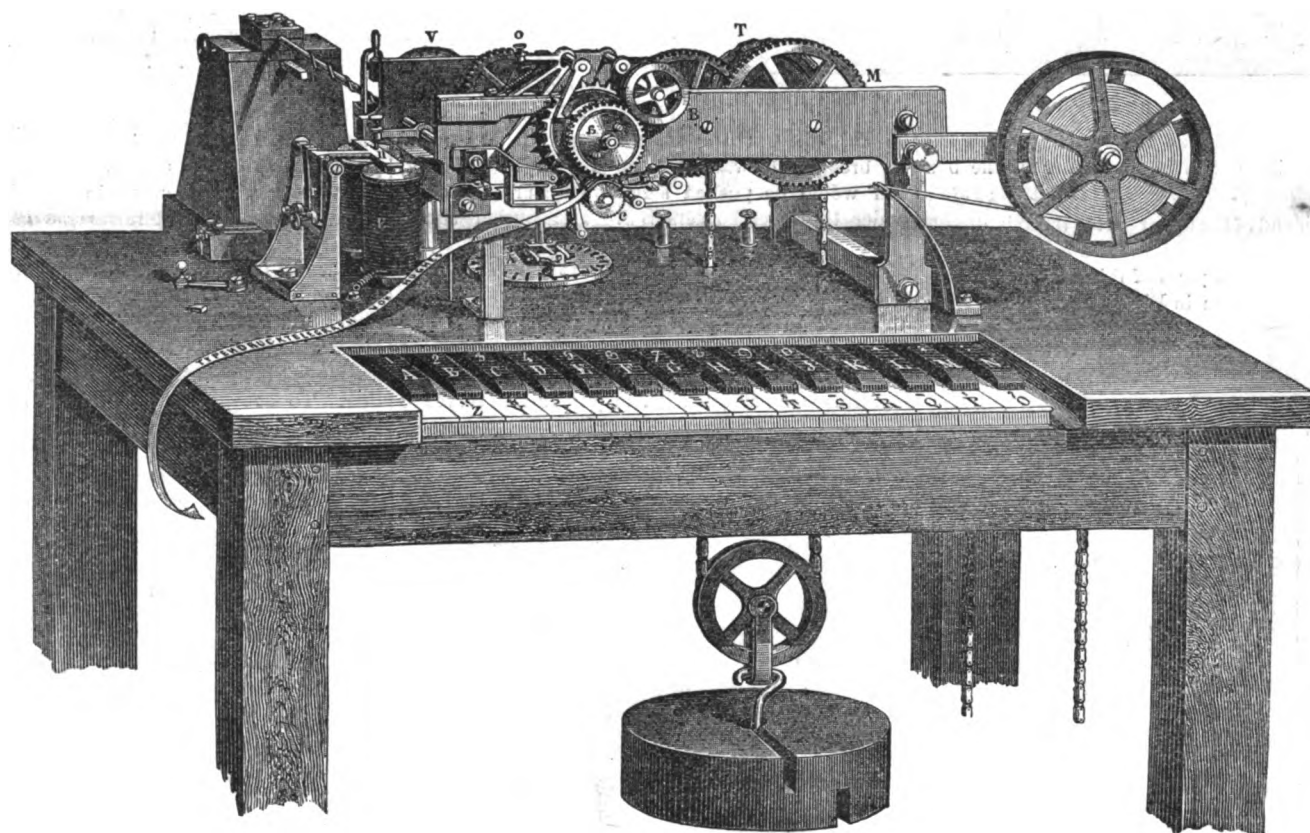


Figure 1.

stroy the synchronism absolutely required of both corresponding apparatuses, and, secondly, because at the flying pressure of the slip of paper against the type wheel, which revolves very rapidly, the impression of the letters would come off very inaccurately, even to the extent of being blotted out. In both cases, however, the reverse of these suppositions is the fact. Professor Hughes arranged the different parts of his apparatus in such an ingenious manner, that not only was synchronism maintained, but the letters were printed as distinctly and sharply as if done by a printing press.

In order to overcome the retardation of the type

The principal parts of the Hughes apparatus are as follows:

1. The keys and the sledge.
2. The wheel work and the axis of the type wheel.
3. The printing axis and the printing works.
4. The electro-magnet and the ratchet of the printing work.
5. The obtaining of synchronism or the regulator.
6. The course of current and the acting together of the electrical and mechanical power.

THE KEYS AND THE SLEDGE.

The transmission of a message is effected by

In the ordinary position these pins are kept down by means of the spiral springs (Figure 4); their upper rounded off tops are then lying in the flat of the covering-plate of the box A in its corresponding openings, as will be seen in Figure 5. When, however, a key is depressed, then the opposite end of the lever K, K' is raised, and the corresponding pin k is brought forward a little out of its opening in the covering-plate of the box. A side projection, O, (Figure 4), to which the spiral spring is attached, prevents it from coming entirely forward. In order to accomplish the latter, it has previously to receive a side push in the direction of the center of the box

each axis K" is connected to the positive pole of the line battery, the negative of which is grounded.

At the receiving instrument, the current arriving from the line passes through the electro-magnet, which effects the printing, and over Q, r, and P to earth.

In transmission, when a key is depressed, the current is from + pole, over K" and k. When the steel disc S of the rotating sledge comes in contact with k, the course of the current is from +, through K" k S (as v is separated from r) Q and L, to the other station. This current is of very small duration. The steel disc S always covering three pins at the same time, the circuit of box A having twenty-eight pins, and the sledge rotating twice in one second, the duration of the contact between S S and k is $\frac{28}{1000} = 0.028$ seconds, or about the one-nineteenth part of a second. This short duration of current is sufficient for land wire circuits of ordinary length, but not for very long aerial or submarine lines. In working the latter, the speed of rotation of the sledge should be reduced, or the surface of the contact discs S S enlarged. When, for instance, the latter piece covers six pivots, and the speed of rotation being as before, the duration of the current would be 0.1072 seconds.

[From the Telegraphic Journal.]

DUPLEX AND QUADRUPLE TELEGRAPHY.

BY ARTHUR R. GRANVILLE.

Without question the Americans are maintaining their ground for ingenuity and enterprise in the electrical world by turning their attention to telegraphic inventions. Although the practicability of duplex telegraphy was known as a scientific curiosity quite twenty years ago, it was far in advance of its age, and could not be put to any use by reason of certain difficulties—insuperable, according to the then known laws of electricity—so that the invention lay fallow for that period. A further reason for the invention not being followed up may be found in the fact that the traffic of those days was easily met, and telegraph engineers were not goaded on to investigate the difficulties attending the introduction of a system which, by enabling lines to perform twice their previous amount of work, has virtually doubled the efficiency of the wires in use.

To an American, Mr. Stearns, belongs every credit for dispersing those difficulties by a happy use of the condenser. Though not the inventor of the system—the honor of the invention belonging to Dr. Gintl, of Vienna, and W. H. Preece, of Southampton, Messrs. Siemens, Halske and Frischen, of Berlin—yet to him belongs the highest praise for having resuscitated an old laboratory experiment; for having nursed and trained it from infancy to maturity; and for introducing it to the practical world as a valuable system, requiring but slight additions to the instruments in use amongst telegraphers to render it ready for immediate practice. And so successful has the working of the "duplex" proved, that in a little over two years it has established itself as a great and most profitable system, and may be regarded as indisputably one of the most important turning points in the history of telegraphy and electrical science. It is reckoned equal in importance to the discovery of Steinheil, who demonstrated that return wires could be dispensed with by the use of earth plates. In resultant effects the "duplex" is strikingly similar to Steinheil's discovery, since both have doubled the resources of telegraphy—the former *directly*, by actually doubling the working capacity of wires; the latter by halving the lengths of lines, inasmuch as return wires were proved to be no longer needed.

The benefits arising from the "duplex" system bid

fair to be multiplied still further by the joint labors of two Americans, Messrs. George B. Prescott and Thomas A. Edison, who announce the perfecting of what they designate the "quadruple system." This system is described as a "new process of multiple transmission, by which two messages can be sent simultaneously in the same direction over the same wire, and either message can be dropped at any way station on the circuit." The "duplex" system can also be applied to this "multiple" system, so that *four* messages may be dispatched together over the same wire in the same direction. The recommendation in favor of the "quadruple" are that, like its predecessor, the old Morse key can be used, and the only expense attending its introduction is the purchase of additional parts of machinery; there is no sweeping away of old appliances and substitution of new ones. The Western Union Telegraph Company, of which Mr. Prescott is electrician, is about to try this system—in fact, put it into practice on all their lines—so that we shall shortly learn with what success the system is capable of being worked. Of this we may be certain, that should failure threaten the system, Messrs. Prescott and Edison will not spare strenuous efforts to overcome whatever difficulties may prevent themselves.

How this "quadruple" result is obtained has not yet been explained, but the method is not difficult to conjecture. After the "duplex" had been perfected by Messrs. Gintl, Siemens, Halske and Frischen, other physicists endeavored to find a method exceeding even that, and the result of their researches was that, in 1855, Stark, of Vienna, proved two messages could be sent along a single wire in the same direction. His plan was to launch, by two keys, two currents of different potentials into the wire, to act upon two relays at the receiving station. These relays were arranged so that when the weaker current alone traversed the circuit, only one relay was acted upon; when the stronger current traversed the line the other relay was worked; when both currents were in circuit, then both relays were set in action. How the arrangement was effected may be seen in Mr. Sabine's "History and Progress of Telegraphy," and it is no doubt this arrangement—perfected by the aid of modern experience gained in working the duplex system—which is about to be adopted in the offices of the Western Union Telegraph Company. Should this system succeed, there surely seems to be no reason why the number of messages capable of being transmitted along a given wire should not be still more increased by the addition of further appliances and the removal of difficulties, which, from experience gained in working the "duplex" and "quadruple" systems—may be even anticipated. What, *ever*, indeed, should be the ultimate perfection of the multiple system, whether by English enterprise or not, the chief honor belongs to the Americans for being the first *adapters* who cleared the way and acted as pioneers.

ELECTRO-TORSION.—Mr. George Gore has shown that a rod may be brought under the influence of electric currents in such a way as to experience a twist amounting to as much as a quarter of a circle. This twist is always attended by the emission of sound, and is produced by the combined influence of helical and axial currents of electricity, one current passing through a long copper wire surrounding the bar, and the other in an axial direction through the bar itself. The result is explained as due to the combined influence of the magnetism induced in the bar by the coil current, and of the transverse magnetism induced in it by the axial one. The current flowing from a north to a south pole produces left-handed torsion; a reverse one, right-handed torsion, *i. e.*, in the direction of an ordinary screw.

FOREIGN ITEMS.

THE Western and Brazilian Telegraph Company have notified that their cable between Pernambuco and Bahia being under alteration, the through communication with Bahia and stations beyond is temporarily suspended. Pending the interruption, all messages for places south of Pernambuco down to Buenos Ayres and the West Coast of South America will be sent by post between Pernambuco and Bahia to be telegraphed thence to their destination.

THE Great Northern Telegraph Company have obtained a concession from the Chinese Government for the establishment of a land line from Amoy to Foochow, and as the erection of it has already been commenced the important port of Foochow will soon be in telegraphic communication with Europe. In Japan the Company's repairing steamer is at present submerging cables on account of the Japanese Government to connect Nippon and Yesso.

THE official report of the telegraphs in the Swiss Confederation during the first six months of the present year shows that 775,316 telegrams were dispatched from one part of the Republic to another, being an increase of 84,000 in the corresponding period of last year. The foreign telegrams, arriving and dispatched, number 237,210, showing also a slight increase. The receipts have also increased to 759,051 fr., but the expenditure has also been augmented, and there is a deficit on the whole of over 110,000 fr.

THE Post-office cable between Holyhead and Dublin has at length been repaired and communication restored.

THE number of messages passing over the Cuba Submarine Telegraph Company's line during the month of August amounted to 1,725, estimated to produce £2,000, against 1,260 messages, producing £1,216 in August last year.

THE number of messages of twenty words that passed over the Barcelona-Marseilles cable was for the month of August 6,138.

THE total number of messages forwarded from postal telegraph stations in the United Kingdom during the week ended the 5th inst. was 392,133, and during the corresponding week of 1873, 301,572; increase, 30,561.

GREAT NORTHERN TELEGRAPH.—The receipts for the month of August amounted to 414,553 fr. (£16,582), and for the month of August, 1873, to 331,238 fr. (£13,249). The total traffic receipts from the 1st of January to August 31 amounted to 2,914,362 fr. (£116,574), and for the corresponding period in 1873 to 2,053,850 fr. (£82,134), showing an increase of 861,012 fr. (£34,440).

THE Cape Parliament has authorized an outlay of £46,945 for electric telegraphs.

At the meeting on the 19th of August of the Mediterranean Extension Telegraph Company, Limited, a dividend at the rate of 3 per cent. per annum on the Ordinary shares, as well as the usual dividend on the Eight Per Cent. Preference Stock, was declared, leaving £500 to be carried to the reserve fund.

THE Eastern Telegraph Company's traffic receipts for the month of July, 1874, amounted to £27,247, and to £28,975 in the corresponding month of 1873.

THE traffic receipts of the Eastern Extension, Australasia and China Telegraph Company (Limited) for the month of July, 1874, amounted to £19,641, and for the corresponding period of 1873, to £18,190.

ARGUMENT OF MR. G. P. LOWREY UPON THE POSTAL TELEGRAPH BILL.

In accordance with resolution, the Committee on Appropriation of the House of Representatives gave the session of May 27, 1874, to the hearing of the argument of Mr. G. P. Lowrey, on behalf of the Western Union Telegraph Company, in reply to that of Mr. Gardiner G. Hubbard, delivered before the committee on the evening of the 21st and morning of April 23.

Mr. GROSVENOR PORTER LOWREY, counsel for the Western Union Telegraph Company, came before the committee and made the following statement:

Mr. CHAIRMAN AND GENTLEMEN: All who are here remember the days when there were no telegraphs. If we should for a moment be able to realize what would be the condition of business or social affairs now, were we suddenly, with our accustomed dependence upon the telegraph, remitted to that period and left without it, we should be aided in comprehending what has been done by the men for whom I now appear. They have, under great financial and physical difficulties, established for the convenience of the American public this greatest of modern inventions in such a way as to make it available for all commercial and social affairs at rates of compensation which, although not so low as Mr. Hubbard seems to desire, and is willing, in a certain unsecured way, to promise, are yet so cheap that no one but himself has complained of them.

The Western Union Telegraph Company, for which alone I speak, and which represents by no means all the telegraph interests of the country, operates in this country more miles of telegraph line than all Switzerland, Sweden, Holland, Belgium, Hungary, Spain, Bavaria, Denmark, Norway, Portugal, Greece, Wurtemberg, and Great Britain combined. It operates more miles of telegraph and annually transmits more messages than all Germany, Spain, Hungary and Russia, notwithstanding the fact that the countries have nearly the same area of territory, and nearly four times the population of the United States. Europe has a population of 800,000,000, and sends annually 50,000,000 messages, being one message to six persons. The United States have 40,000,000 inhabitants, and the Western Union Company alone sends 15,000,000 messages, being one message to two and a half persons.

The enterprise, energy, and public spirit with which private persons have acted in the introduction of the telegraph in this country, as compared with the energy and public spirit of those governments in Europe which have assumed the same duty for the people, will be shown by the telegraph statistics to which I shall call the attention of the committee. I shall begin with 1866, the year in which Mr. Scudamore, the present head of the English telegraph system, began to urge upon Parliament with some effect the scheme which has since been successfully established, so far as the law is concerned, in England, and the year in which the first available yearly statistics began. In 1866 England had 80,466 miles of telegraph wire, and in 1873 108,403 miles, being an increase of 22,936 miles, or 28 per cent. In 1870 the English government took possession of the telegraph lines, and made the reduction of rates, which were relied upon by Mr. Scudamore (mistakenly, as events have proved) to increase vastly the business. The period I have taken—from 1866 to 1873—contains, therefore, two years of governmental control in England, the entire increase in miles of wire being 28 per cent. In 1866 the Western Union Telegraph Company had 75,686 miles of wire, and in 1873 173,517, being an increase of 97,831 miles, or 129 per

cent. during the same period. In 1866 England had 2,151 telegraph offices, and in 1873 5,474, being an increase of 3,323, or 154 per cent. In 1866 the Western Union Telegraph Company had 2,250 offices, and in 1873 5,955 offices, being an increase of 3,705, or 164 per cent. In 1867 England transmitted 7,500,000 messages, and in 1872, under government patronage, and with cheap rates, (from which so much was expected,) transmitted 14,858,000 messages, being an increase of 7,358,000, or 98 per cent. In 1868 the Western Union Telegraph Company sent 5,733,394 messages, (beginning one year later than England, and with nearly 2,000,000 less messages,) and in 1873 it sent 13,362,832 messages, being an increase of 7,629,438 messages, or 133 per cent.

Mr. HUBBARD. Are those figures on the same basis in each case?

Mr. LOWREY. Precisely. I am reading from a paper handed me by Mr. Prescott, whose authority in telegraphic statistics is well known.

Mr. HUBBARD. I would like to ask if the number of messages of the Western Union Telegraph Company in 1866 includes all the newspaper messages?

Mr. LOWREY. I have not given the statistics for 1866.

Mr. HUBBARD. Well, for 1868?

Mr. PRESCOTT. We have taken Mr. Hubbard's own figures, from which I think the newspaper messages are eliminated.

Mr. HUBBARD. They are eliminated from the first statement, and not from the last.

Mr. PRESCOTT. They are eliminated from both. We took your own figures, as given in the report of the Senate Committee.

Mr. HUBBARD. I took them from the reports of the Western Union Telegraph Company. I understand that the first does not include newspaper messages, and that the last does.

Mr. PRESCOTT. Neither of those items includes newspaper messages. The annual report of the Western Union Company for 1873 states that the number of messages sent during the year ended June 30, 1873—including press messages—was 14,456,832.

Mr. LOWREY. The committee will find that we have taken our figures from the Senate report, which contains statistics of the business of the Western Union Telegraph Company.

Mr. HUBBARD. I would like to ask your authority for the number of messages sent in Great Britain in the first period?

Mr. LOWREY. We take for that Mr. Hubbard's estimate in his letter to the Postmaster-General published in 1868. It is proper to say that we have been compelled to prepare these statements here in Washington, away from the records of the company, and have necessarily availed ourselves of some of Mr. Hubbard's figures found in public documents.

In 1868 the average toll on the English lines (this was at a time when those lines were still under the control of private companies) was 38 cents per message. In 1874 the average toll is 28 cents, being a reduction of 10 cents per message, or 26 per cent. In 1868 the average toll of the Western Union Telegraph Company was \$1.10 per message, and in 1874 55 cents, being a reduction of 55 cents per message, or 50 per cent.

Mr. HUBBARD. I would like to know how that last rate is arrived at?

Mr. PRESCOTT. We took the total number of messages sent from the 1st of July, 1873, up to the 1st of April, 1874, and divided the total receipts by the number of messages. The quotient gives us the average rate.

Mr. HUBBARD. Did that include dead-head messages?

Mr. PRESCOTT. It includes partially-paid messages, and some free messages.

Mr. HUBBARD. Did that include cable-grams?

Mr. PRESCOTT. Yes, it included cable-grams also. It did not include newspaper messages or newspaper receipts.

Mr. HUBBARD. I supposed it included all the dead-heads.

Mr. PRESCOTT. No, sir.

Mr. HUBBARD. Did it include all those that were given as dead-heads in the former reports?

Mr. PRESCOTT. The report was made up the same as in the former case. Some of our messages are sent free, and are subsequently partly paid, and these messages are included in the report. The free messages, however, amount to a very small percentage of the whole. They were not eliminated for the want of time.

Mr. HUBBARD. The amount is about 8 per cent., I believe.

Mr. PRESCOTT. It is less than 5 per cent.*

Mr. LOWREY. This is what has been done by American private persons, as compared with what has been done in other countries by government aid, and at government expense. I make the comparison merely for the purpose of calling attention particularly to the class of persons whom this committee is called upon by Mr. Hubbard to deal with very severely. The bill before the committee is practically a bill to oust all persons who are engaged in the business of telegraphing, with a prospect of earning some money in the future (they have earned but little in the past for their stockholders), and to put in their place Mr. Gardner G. Hubbard, a gentleman whose merits are better known here, where he resides, than they are to me; but who has certainly neither practice, experience, nor merits as a telegrapher. I do not find, on examination, that his bill reveals any other purpose.

Mr. Hubbard, in discussing the "union of the telegraph with the Post-Office," which is the pleasing name he chooses to give to this scheme for taking our business and profits to himself, said that it was necessary to consider the power of Congress on this subject. It struck me at the time as an eminently judicious and prudent suggestion, and I regretted much that he did not choose to follow it up. He did, of course, refer to a section of the Constitution, but he might as well have referred to any other section, as far as I can see. It was a profunctorial reference to the Constitution; a sort of form which everybody feels bound to go through who professes to discuss a constitutional question. But he did not find in it, nor do I find in it, any use that he could make of it, or anything that would aid anybody to see how Congress obtained the power to do the specific thing he requests it to do. I shall endeavor, as well as I may, to supply the lack of discussion of the constitutional question, and shall ask the attention of the committee for a few moments to what it is asked to do in aid of this extraordinary and totally unprecedented interference by the National Government in favor of one private person and against a large number of, other persons at least not less deserving of the support of Congress.

* I find upon examination that commercial news and signal-service messages were not included in the above calculation, while the receipts for both were included, which materially changes the average rate. The receipts for transmitting telegraph messages, exclusive of press reports, from July 1, 1873, to April 1, 1874, were \$5,701,278.79. The number of paid messages sent was 10,329,840. Number of partially-paid and free messages sent was 473,718. Total number sent, 10,803,558. Average rate (excluding partially-paid and free), 55 cents; average rate, including partially-paid and free, 53 cents.

GEORGE B. PRESCOTT.

Mr. Hubbard asks you to report a bill by which Congress creates a corporation to do business within the States. I do not wish to speak with perfect certainty, because I have not examined all the legislation on the subject (as it would have required more time than I have to give to it), but I believe that Congress never has yet created a corporation whose business must necessarily be done within the limits of the States, except it were a corporation having immediate connection with, and reference to, some express powers of Congress.

Mr. LOUGHRIDGE remarked that Congress had created insurance corporations.

Mr. LOWREY. In a case argued in the Supreme Court, one of the judges asked, with a great deal of point, whether it was supposed by anybody that, because life insurance was a general benefaction, Congress would therefore have power to create life insurance companies. Of course Congress may create corporations within the District of Columbia. I believe Jay Cooke's National Life Insurance Company was so chartered.

Mr. LOUGHRIDGE. I remember that there was such a bill passed chartering a life insurance company in this District.

Mr. LOWREY. This bill is very careful to provide that the corporation shall be a corporation in the city of Washington, but that is merely a verbal evasion. The business which the corporation is created to do must necessarily be done in the States, and through the ownership of real property in the States, and by the exercise of that most important corporate function of taking tolls. Now, a life insurance corporation existing here may undoubtedly be authorized to make contracts in the various States, unless the States should provide otherwise. Such a corporation might enter into a certain class of contracts; but the special function of a corporation of this character is to do what in early times was done by the sovereign, and which is now sometimes imparted to corporations, viz., to stand in the way and take tolls. That is what a telegraph company has to do, to take tolls, with power to refuse to send messages unless those tolls are paid. That is a corporate power of a very high character. It is that power which Congress is asked to give to this company, to be exercised within the States. I remember having asked Mr. Hubbard, at the time when he referred to the pneumatic tubes in the cities, where he supposed he would get his authority to lay down pneumatic tubes in the city of New York, for instance.

The Supreme Court of the United States with reference to the subject of which I am now speaking, in the case of the Liverpool Insurance Company against Massachusetts, 10 Wallace, 573, and in the case cited in 8 Wallace, 868, decided that a corporation created by one State can exercise in another State none of the functions and privileges conferred by its charter, except by comity and consent of the latter State.

Of course the same remark applies with still more force to corporations created by the United States, because the States stand upon equal terms as between themselves with reference to the matters reserved between them, and may act upon reciprocal comities to such a degree as almost to erect the expectation of comity into a right to have the comity. The pending bill would authorize this corporation to own real estate in the States and necessarily to exercise the right of eminent domain. It authorizes the corporation so created to erect its lines throughout the country, and especially to erect them on all post-roads. "Said company shall have the right to

construct lines on all post-roads, and shall provide lines of telegraph to every postal-telegraph office." The meaning of that clause is that inasmuch as, by act of Congress, a name has been attached to all railroads and highways, that of "post-roads," Congress is now called upon to authorize this corporation, without compensation or without any provision for it, without any process of condemnation or adjudication as to whether the property is required or not required, to go upon private lands and there erect its poles, without the consent of the owner. It is to do so on all railroads and on all highways, on all public roads and canals. I believe these are all named "post-routes" by various acts of Congress. This necessarily involves the exercise of eminent domain, and the assumption necessarily is that Congress has this right of eminent domain over the ground, without the necessity of judicial intervention; and it authorizes this private telegraph corporation to exercise that right without ordinary judicial intervention. That would be an exercise of eminent domain, pure and simple, unguarded by the courts. Now there is no eminent domain for any such purpose in the Government of the United States for its own public uses, and much less for the private uses of a corporation. It is proper that I should say to the committee that the question which I am now discussing is before the Supreme Court in a case which will be argued in the early days of the next session, and which would have been argued at the last session but for an event affecting one of the counsel, which caused a postponement. I presume that prudence will suggest to the mind of every member of this committee that, with reference to a question of such very grave importance, it will be better to wait for the issue of that case. The Southern and Atlantic Telegraph Company, a corporation of the State of New York, has assumed authority, under the act of 1866, which perhaps this committee is familiar with, (the telegraph act, which authorizes all telegraph companies to go on all post-routes,) to go upon the lands of the Orange, Alexandria and Manassas Railroad Company and set up its poles without condemnation of the land and without compensation to the railroad company. The railroad company was about to remove the poles, but an injunction was obtained, and the case is now in the Supreme Court of the United States, on the question of the constitutionality of the act of 1866, and of the legality of the proceedings of the Southern and Atlantic Telegraph Company in thus appropriating to itself the lands of this railroad company. So you see that there is in the Supreme Court, in an actual case, the question which must necessarily arise in many actual cases after Mr. Hubbard's bill is passed, if it ever goes into effect.

This, perhaps, is a proper place to call the attention of the committee to what it is that constitutes any road a post-road, and what sort of jurisdiction the General Government gets over your property and mine by declaring it to be a post-road. The act of 1838 is the first on the subject. It declares the railroads, then and thereafter to be built in the United States, post-roads: and, having attached to them that epithet, it proceeds to say that the Postmaster-General is authorized to contract for the transportation of the mails over these roads, provided he can contract for a sum not exceeding 25 per cent. of what he can get the mails carried for by stages. Nothing further than that has ever been added on that subject. Post roads remain simply roads over which the Postmaster-General may, without further reference to Congress, contract for the carriage of the mails.

Mr. STARKWEATHER. You mean to say that the

more recent acts do not extend the principle of the act of 1838.

Mr. LOWREY. Yes; that is what I mean to say. The effect of declaring a road a post-road was considered very early in the State of Kentucky, in a case which is doubtless familiar to the committee, the case of Dickey vs. The Maysville Turnpike Company (7 Dana's Reports), in which the plaintiff had assumed that a contractor for the carriage of the mails had the privilege of passing over a bridge upon a post-road without paying toll. The Kentucky Court of Appeals decided that the power given to Congress by the Constitution to establish post-roads enabled them to make, repair, keep open and improve post-roads when they should deem the exercise of that power expedient. But in the exercise of the right of eminent domain on this subject the United States have no right to adopt and use roads, bridges and ferries, constructed and owned by States, corporations or individuals, without their consent, or without making to the parties concerned just compensation. If the United States elect to use such accommodations, without the performance of such a previous condition, they stand upon the same footing, and are subject to the same tolls and regulations as private individuals. This important decision is well supported by sound reasoning.

The question arose again in a case in the United States Circuit Court of Pennsylvania, in which the language of the Court is so pointed that, perhaps, it may be well to read it here. The opinion was given by Irvin, J. I read an extract from it:

But the complainants allege that they are entitled to an injunction on another ground. They are contractors for carrying the mails of the United States over the road they have made, in railroad cars from Cleveland to Erie, and from thence back to Cleveland; and by an act of Congress this road has been made a post-road.

The power given by the Constitution to establish post-roads has always been construed to mean, and I think rightly, such roads as were regularly laid out by authority of the States, or by counties under the laws of the States. The Government of the United States cannot construct a post-road within a State of this Union without its consent; but Congress may declare, that is, establish such a road already opened and made a public highway by the direct or indirect authority of the State.

The post-roads of the United States are the property of the States through which they pass; they may temporarily part with the possession of them by charter, and the grantees, while the charter continues, have the right to preserve such roads and prevent their threatened destruction. The United States have the mere right of transit over these roads, for the purpose of carrying the mail, and in case of obstructing this right, their laws provide an adequate remedy. The Government itself could not obtain the injunction applied for to prevent the destruction of a mail-road; the right to do so follows the right of property or possession. A mail-contractor and any other person may have a right of action for damages in the Courts of the State for an obstruction to a mail-road, or the wrong doer there may be punished by indictment; but no injunction can legally issue upon an application to restrain a threatened injury to the road.—(Cleveland, Painesville and Ashtabula Railroad Company vs. Franklin Canal Company, 1 Pitts. L. J., 24 December, 1863.)

Similar language is used in the case of The State of Pennsylvania vs. The Wheeling Bridge Company (18 Howard), by McLean, Justice, in the dissenting opinion, it is true; but the dissent was not on this point, because it was agreed by everybody, and will be agreed by you, gentlemen, who are so well accustomed to consider all legal and judicial questions, that it is not within the power of Congress to limit the right of ownership or the privileges which the owner of the post-road has in his property by calling it a name.

[To be continued.]

TARIFF BUREAU.

SEMI-MONTHLY CIRCULAR.

EXECUTIVE OFFICE,
WESTERN UNION TELEGRAPH COMPANY,
145 Broadway, New York, October 1, 1874.

To all offices on W. U. Lines:

The following changes and additions have been made since the date of the last circular:

GENERAL INFORMATION.

Deatsville, Ala., closed.
Gilmer's, Ala., changed to Hanceville.
Ironton, Ala., changed to Oxmoor.
Stonewall, Ala., reopened.
Boughton, Ark., closed.
Canon City, Col., (formerly La Bran), will hereafter be in square 558, and should be checked at the State, local or square rate.

Newtown, Conn., closed.
Pequot House, New London, Conn., closed.
Seaview House, West Haven, Conn., closed.
Caledonia, Pulaski Co., Ill., closed.
Dunreith, Ind., closed.
Patriot, Ind., re-opened, tariff for other lines 30 and 2 from Aurora.

Shidler, Ind., (heretofore given as Shiedler), re-opened, square 252.

Johnson, Ky., re opened.
In consequence of storms and high water, the lines between Matamoras and Reynosa in Mexico, will be interrupted for nearly a month. Business for Mexico will therefore for the present be forwarded by mail from Matamoras to Reynosa, and thence by telegraph to destination.

Deer Park, Md., closed.
Silver Lake Grove, Plympton, Mass., closed.
The "tariff for other lines" from Springfield to Barrett's Junction, Mass., is 25 and 2.

An Gres Lumber Boom, Mich., closed.
Business for Morgan's, Newaygo Co., Mich., will hereafter be checked to Allenton.

No. Adams, Mich., closed.
There is now a W. U. office at South Saginaw, Mich., square 230, check direct.

Business for East St. Louis, Ill., Carondelet and South St. Louis, Mo., should be checked to St. Louis, Mo., at the St. Louis rate.

The following Summer offices in New Hampshire have been closed for the season:

Bethlehem.	Mt. Washington Depot.
Crawford House.	Profile House.
Fabyan House.	Twin Mountain House.
Glen House.	Waumbeck House.
Mt. Washington.	Weirs.

West Milan, N. H., closed.
Deal, N. J., closed.
Ocean Grove, N. J., closed. Messages are delivered from Asbury Park, N. J., at delivery charge of 10 cents per message. The office at Croton, N. Y., will hereafter be known as Croton Landing.

Guymard, N. Y., closed.
Sea Cliff, L. I., N. Y., closed.
Sandy Creek, N. Y., is an office of the Montreal Tel. Co.; the "tariff for other lines" is 25 and 1 from Utica, instead of 30 and 2 from Syracuse, as given in tariff book.

The P. O. A. of Salisbury, Orange Co., N. Y., is Salisbury Mills.

Summit, Clinton Co., N. Y., changed to Cherubusco, (the latter is in the tariff book).

Business for Tompkinsville, S. I., N. Y., will hereafter be checked to Quarantine, S. I.

Garysburg, N. C., closed.
Pleasant Hill, N. C., closed.
Little Mountain, O., closed.

The following offices in Ontario are closed:
Clarence. Lachute Mills.
Edgar. Mara.
Judsonville. Riviere Quelle.
Taylor, Ont., changed to Bismarck, (the latter is in the tariff book).

Ottercliffe, Ont., should read Attercliffe, (the latter was given as a new office in JOURNAL, Sept. 1).

Greensboro, Pa., closed.
Manayunk, Philadelphia Co., Pa., closed.
Monterey, Clarion Co., Pa., closed.
Business for 159 Newport, Lawrence Co., Pa., will hereafter be checked direct.

The P. O. A. of Sonman, Pa., is Portage, Cambria Co.

The following offices in Quebec are closed:
Bainsville Station. Perth.
Beloell. So. Bolton.
Elgin. Sutton.
Grecks Point. Tartigou.
Mission Point. Queensville.
Greenville Village, Que., will hereafter be known as Greenville Station.
Sayabec, Que., changed to Amqui, and South Hinchbrook, Que., changed to Helena. (Amqui and Helena are both in the tariff book.)

Narragansett Pier, R. I., closed.
Watch Hill, R. I., closed.
Highgate Springs, Vt., closed.

The following Summer offices in Virginia have been closed for the season:

Allegheny Springs.
Bath Alum Springs.
Healing Springs.
Hot Springs.
Jordan Alum Springs.
Rockbridge Alum Springs.
Rockridge Baths.
Orkney Springs.
Sweet Chalybeate Springs.
Yellow Sulphur Springs.
Berkeley Springs, W. Va., closed.
Sweet Springs, W. Va., closed.
Cotton Hill, W. Va., was incorrectly given in last JOURNAL as Colton Hall.

NEW OFFICES.

285 Hanceville, Ala., (formerly Gilmer's).
294 Oxmoor, Ala., (formerly Ironton).
267 Fairburn, Ga.
257 Hogansville, Ga.
* Florence, Ind., 30 2 253 Aurora.
300 Haubstadt, Ind.
* Marklands, Ind., 40 3 253 Aurora.
* North's Landing, Ind., 25 2 253 "
* Vevey, Ind., 40 3 253 "

455 Hastings, Iowa.
438 Thayer, "
25 West Dudley, Mass.
211 Carlton, Mich.
409 Montean, Mo.
92 Fisher's, Ontario Co., N. Y.
* Brownsville, Ont.
* Guysboro, "
* Langton, "
* Pleasant Hill, "
* Staffordville, Ont.
140 Coyle's, Pa.
* Fitch Bay, Que.
* Lotbiniere, Que.
* St. Antoine De Tilly, Que.
* St. Croix, Que.
* St. Jean D' Eschallons, Que.
* St. Paul's Bay, Que.
* St. Remi, "
340 Sommerville, Tenn.

* Fort Worth, Tex., 50 3 511 Dallas. Half-rate messages may be taken for and received from Fort Worth.

435 Pierce Junction, Tex.
203 Ceredo, W. Va.

CUBA CABLE BUSINESS.

On account of the interruption of cable communication between Punta Rasa and Key West, Florida, an additional charge of three dollars per message should be made on all messages to Key West, and to Cuba, and points beyond.

ATLANTIC CABLE BUSINESS.

The Saigon and Hong Kong cable is broken. Messages for Hong Kong, if sent via Falmouth or Teheran, are posted at Singapore; if sent via Siberia, they are posted at Shanghai.

WILLIAM ORTON, President.

TRANSFER SERVICE.

EXECUTIVE OFFICE,
New York, Sept. 25, 1874.

On October 5th money order offices will be established at the following-named points:

In J. F. Wallick's district, Greenville, O.
In G. T. Williams' district, Ashland, Ky.

Duval's Bluff, Ark., has been discontinued as a money order office.

GEO. H. MUMFORD,
Vice-Pres't.

THE TELEGRAPHERS' MUTUAL BENEFIT ASSOCIATION.

ACKNOWLEDGMENT OF RECEIPTS FOR ASSESSMENTS
UP TO AND INCLUDING SEPT. 25, 1874.

ASSESSMENT NO. 66.

22, 26, 31, 37, 70, 76, 82, 84, 100, 101, 120, 143, 154, 156, 158, 160, 164, 171, 189, 190, 191, 193, 197, 206, 218, 220, 227, 230, 248, 252, 254, 280, 288, 316, 323, 341, 350, 353, 357, 362, 364, 366, 378, 380, 382, 394, 402, 411, 412, 418, 441, 447, 466, 468, 469, 470, 471, 475, 476, 482, 484, 511, 512, 514, 556, 557, 560, 569, 573, 574, 575, 584, 586, 587, 590, 600, 608, 609, 642, 646, 648, 649, 655, 656, 662, 663, 664, 665, 669, 694, 701, 706, 710, 712, 714, 717, 723, 724, 728, 742, 772, 780, 781, 782, 783, 785, 786, 790, 802, 806, 812, 818, 820, 823, 836, 838, 842, 870, 875, 876, 897, 904, 905, 906, 928, 930, 931, 938, 942, 944, 949, 954, 957, 959, 963, 964, 978, 979, 980, 1000, 1001, 1002, 1003, 1014, 1016, 1023, 1030, 1031, 1033, 1034, 1041, 1046, 1050, 1057, 1063, 1076, 1080, 1083, 1100, 1101, 1105, 1106, 1107, 1108, 1109, 1110, 1112, 1113, 1115, 1117, 1119, 1120, 1122, 1123, 1125, 1131, 1139, 1141, 1149, 1153, 1155, 1156, 1157, 1159, 1160, 1162, 1164, 1185, 1190, 1191, 1195, 1207, 1208, 1210, 1211, 1217, 1221, 1226, 1227, 1233, 1234, 1237, 1238, 1245, 1248, 1255, 1256, 1260, 1268, 1269, 1270, 1281, 1283, 1284, 1285, 1286, 1288, 1290, 1294, 1339, 1340, 1342, 1344, 1346, 1348, 1349, 1350, 1351, 1352, 1353, 1354, 1355, 1356, 1358, 1359, 1364, 1365, 1366, 1375, 1376, 1405, 1406, 1407, 1415, 1417, 1418, 1426, 1427, 1430, 1432, 1433, 1444, 1448, 1449, 1451, 1454, 1455, 1456, 1457, 1458, 1465, 1469, 1471, 1474, 1475, 1476, 1481, 1483, 1497, 1498, 1503, 1505, 1506, 1507, 1513, 1517, 1518, 1521, 1528, 1529, 1530, 1532, 1542, 1546, 1558, 1560, 1563, 1564, 1572, 1573, 1586, 1589, 1590, 1596, 1597, 1609, 1616, 1619, 1630, 1635, 1644, 1649, 1652, 1656, 1660, 1661, 1662, 1663, 1665, 1666, 1667, 1673, 1676, 1681, 1684, 1687, 1688, 1696, 1699, 1700, 1701, 1704, 1709, 1710, 1713, 1714, 1718, 1723, 1724, 1729, 1733, 1737, 1746, 1747, 1750, 1751, 1753, 1754, 1755, 1756, 1757, 1758, 1759, 1760, 1763, 1765, 1766, 1767, 1768, 1769, 1771, 1773, 1775, 1785, 1788, 1789, 1799, 1802, 1809, 1811, 1812, 1813, 1837, 1838, 1839, 1837, 1838, 1839, 1840, 1841, 1844, 1845, 1857, 1859, 1860, 1863, 1864, 1876, 1877, 1839, 1895, 1896, 1903, 1907, 1915, 1916, 1917, 1922, 1924, 1926, 1942, 1943, 1953, 1972, 1973, 1936, 1991, 1992, 1993, 1996, 1997, 2004, 2007, 2010, 2012, 2015, 2022, 2023, 2026, 2028, 2032, 2035, 2041, 2045, 2050, 2053, 2057, 2061, 2065, 2072, 2074, 2075, 2085, 2092, 2094, 2101, 2103, 2109, 2112, 2119, 2120, 2123, 2131, 2133, 2134, 2136, 2141, 2142, 2143, 2145, 2147, 2154, 2156, 2159, 2163, 2166, 2167, 2168, 2170, 2171, 2180, 2181, 2183, 2184, 2185, 2187, 2192, 2193, 2200, 2203, 2204, 2205, 2206, 2210, 2211, 2217, 2218, 2230, 2235, 2227, 2230, 2231, 2233, 2234, 2238, 2244, 2245, 2246, 2248, 2249, 2250, 2252, 2253, 2254, 2256, 2258, 2260.

ASSESSMENT NO. 68.

4, 16, 23, 25, 37, 46, 53, 58, 54, 58, 60, 64, 74, 75, 77, 86, 91, 93, 95, 113, 122, 131, 140, 145, 157, 188, 208, 211, 217, 245, 269, 277, 289, 301, 302, 312, 346, 349, 352, 361, 372, 333, 385, 405, 436, 464, 467, 509, 522, 536, 542, 546, 547, 553, 555, 564, 579, 615, 636, 646, 659, 685, 714, 715, 721, 729, 731, 734, 740, 742, 769, 815, 821, 835, 839, 858, 859, 873, 875, 880, 913, 917, 923, 932, 941, 991, 992, 1001, 1018, 1089, 1047, 1064, 1061, 1083, 1090, 1126, 1143, 1147, 1148, 1175, 1178, 1183, 1199, 1208, 1226, 1227, 1232, 1259, 1232, 1296, 1300, 1306, 1325, 1345, 1357, 1402, 1403, 1404, 1409, 1410, 1494, 1488, 1489, 1517, 1532, 1584, 1555, 1568, 1571, 1589, 1591, 1672, 1676, 1681, 1708, 1723, 1735, 1773, 1775, 1853, 1894, 1900, 1901, 1919, 1944, 1950, 1951, 1957, 1965, 1991, 2019, 2021, 2025, 2027, 2030, 2049, 2082, 2089, 2097, 2108, 2112, 2125, 2128, 2164, 2169, 2174, 2175, 2178, 2180, 2197, 2199, 2201, 2213, 2228, 2229, 2239, 2240, 2257, 2259, 2263, 2269, 2274, 2287, 2289, 2291, 2299, 2300, 2301, 2302.

ASSESSMENT NO. 67.

2, 15, 17, 29, 97, 98, 319, 447, 565, 916, 1094, 1074, 1154, 1169, 1205, 1276, 1527, 1681, 1915, 2237, 2242, 2271, 2272, 2273, 2275, 2276, 2277, 2278, 2279, 2280, 2281, 2282, 2283, 2284, 2285, 2286, 2288, 2290, 2292, 2293, 2294, 2295, 2296, 2297, 2298.

ASSESSMENT NO. 65.

438, 1798, 2070.
Members of the Association who look to the JOURNAL OF THE TELEGRAPH for receipt of assessments paid, will please take notice, that an acknowledgment of the receipt of one assessment should be taken as a receipt for all previous assessments.

INTELLECTUAL CULTURE.—A cultivated mind may be said to have infinite stores of innocent gratification. Everything may be made interesting to it, by becoming a subject of thought or inquiry. Books, regarded merely as a gratification, are worth more than all the luxuries on earth. A taste for literature secures cheerful occupation for the unemployed and languid hours of life; and how many persons, in these hours, for want of innocent resources, are now impelled to coarse pleasure? How many young men can be found, who, unaccustomed to find a companion in a book, and strangers to intellectual activity, are almost driven, in the long dull evenings of winter, to haunts of intemperance and bad society.

POLE LIGHTNING ARRESTER AND ROD.

In our issue of August 1, 1874, we published an illustrated description of a mode for providing telegraph poles with earth wires, or contact conductors, for carrying wet weather escape directly to the earth, instead of permitting it to leak into the neighboring wires, and which should also serve the purpose of lightning rods. We now produce a cut showing the admirable plan devised by Col. R. C. Clowry, Superintendent of the Second District of the Central Division, and which has been adopted quite extensively in several other districts in that Division, and employed for several years past with the most satisfactory results, as will appear from the following statement made by Col. J. J. S. Wilson, Superintendent of the First District of the Central Division: "In 1870 I instructed Superintendent Beach of the Toledo, Wabash and Western lines, to put a lightning rod on every pole between Decatur, Ill., and St. Louis, 110 miles, and notwithstanding the fact that

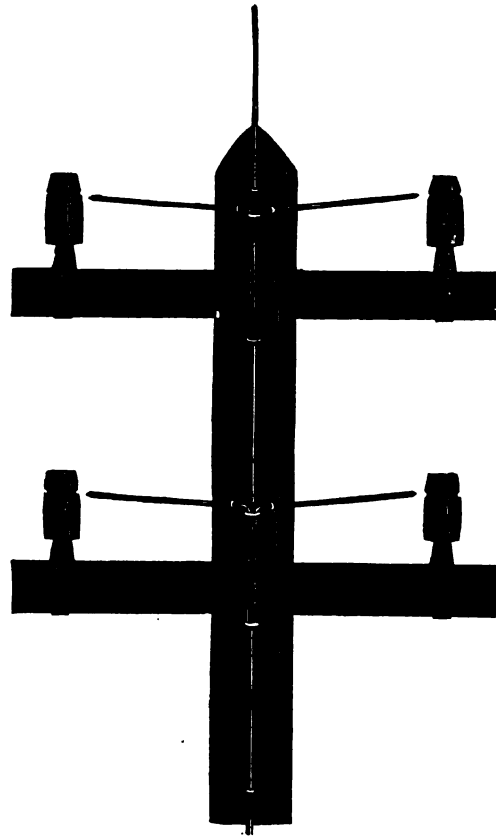
above, the line wire on the top of the pole, the bending of the ground wire would be likely to ground the upper line wire. The end of the ground wire might be extended to within an inch of the tie wire, or the main wire itself, but we have found it dangerous to extend the ground wire to the top of a ring and pin pole, as the snow and sleet packs in even on the smallest surface, and the iron ring adds to the escape.

The plan we have adopted [see illustration] is free from these objections, as the snow and sleet have no support upon the upright round and smooth surface of the poles, and the lightning wires cannot possibly come in contact with the main line when bent or displaced. The English plan has no side extensions from the ground wire, and while the pole may be protected from being shattered, the lightning on the line wires would not be arrested at the pole, but would pass into the office. Our ground wires on line poles have no side extensions, and are mostly intended to protect the poles, while our office pole arrangement protects both the pole and the office. With our long cross arms and dry atmosphere we are not troubled much with wet weather crosses, as is the case in the moist climate of England, and the cross arm wrappers would only add to the difficulties previously stated.

It may be said that if the snow and sleet reach from the arm to the insulator it is better to have a ground than a cross, but on our very long lines we have to avoid grounds, and it frequently happens that snow, sleet and rain beat on the arm from one side, so as to only ground one wire, if the arm is connected to the lightning rod."

A NEW INVENTION IN TELEGRAPHY.

The *Frankfurter Zeitung* announces that an official in the Bavarian telegraph service has succeeded in making an apparatus which, if found to be of practical utility, may effect a revolution in the present system of telegraphy. The name of this gentleman is H. Becker, and the apparatus he has constructed and to which he has given the name of "Electro-magnetic copying machine," appears to be a perfecting and improvement of Caselli's invention. The proprietorship of the apparatus has already been purchased by the banking firm of Messrs. Oppenheim & Weill, of Frankfurt. Without any assistance from the operator it gives a *fac-simile* of the original manuscript telegram in whatever language written, signatures, portraits, music, plans, etc., conveyed telegraphically to any distance, and in such admirable perfection that in comparing the original with the copy scarcely any difference can be discovered. "We, ourselves," says the above-named journal, "witnessed the transfer from one apparatus to another not only of the lines of welcome issued by the Committee of the Musical Festival recently held in this city, profusely ornamented with instruments, wreaths of laurel, and oak leaves, as well as symbolical arabesques, but also of bills of exchange filled up and signed, state dispatches in cypher, telegram writtens in Greek and Hebrew characters, police notices with the portrait of the person wanted, military maps, such as a general might send to his subordinates to explain the situation described or mentioned in his written dispatches or orders, together with the usual service communications as telegraphed from one station to another. All objects intended for transmission by this apparatus are written or drawn with prepared ink, on silver paper, which is then placed on a revolving cylinder, and then telegraphed off to its destination, where it is received on clean tissue paper, and reproduced with most wonderful exactness."



there is more lightning in that section of the State than in any other portion, he reports as follows: 'The result of this trial has demonstrated the fact that where the rods are perfect not one pole on that line has been destroyed or damaged by lightning, whereas on other roads where they are not used hundreds of poles have been destroyed in a single storm. We have profited by this experience, and have a larger portion of our route, or nearly all of our poles, protected by lightning rods, and we are now putting them on every new pole that is set.' I have, for years, instructed my assistants in constructing lines to put a lightning rod on at least every fifth pole, and it has saved us hundreds of poles."

Col. Clowry says that "the English plan of attaching the ground wires to the poles, shown in our previous issue, is very objectionable, as the snow, sleet and moisture settles on the cross arms, and reaches to the insulator and line wire. Where ground wires have been placed upon the cross arms we have changed them to the opposite side of the pole. If the ground wire is extended up to, or

PORTLAND AND ASTORIA TELEGRAPH LINE.

Articles of incorporation of the Portland and Astoria Telegraph Company have been filed at the County Clerk's office by John West, George Flavel and Wm. Wadhams. The object of the company is to construct, maintain and operate a telegraph line from a point at or near Cowlitz Station, W. T., to Astoria and intermediate points along the Columbia River and elsewhere. The principal office of the company will be in Portland. The capital stock is put at \$15,000, in shares of \$50 each. A telegraph line could be taken overland at a considerably less cost, but the incorporators are satisfied that they can more readily dispose of \$15,000 worth of stock on the river route than they could \$8,000 worth by land. The Western Union Company will give the use of their line from this city to Cowlitz on reasonable terms, and this company will probably be entrusted with the placing of the wire from Cowlitz to Astoria. The promoters have received every encouragement in the scheme. They will have stations at the different fisheries and other points along the river, and it will be their aim to so conduct their line that it shall be of the greatest possible advantage to the public. The work of construction will be commenced at the earliest practicable moment.—*Albany (Oregon) Daily Bulletin*.

THE INTERNATIONAL TELEGRAPH CONFERENCE.

At the International Telegraph Conference, to be held next year at St. Petersburg, a proposal will be made for the neutralization of the telegraphs in times of war. It will be remembered that at the last International Conference, in 1872, at Rome, a similar proposal was submitted by Mr. Cyrus W. Field, the delegate of the United States Government, and warmly supported by the representative of the German States. By a letter from a correspondent at Berlin we now learn that at the St. Petersburg Conference the German Government will again support the American renewed proposal, and strong hopes are entertained of its being agreed to in spite of all opposition. In addition to this, the Congress will be occupied in drawing up a set of regulations in the form of an international code of instructions for the telegraph service, as it is found by experience that the Paris Convention of 1865 contains many items of detail that fluctuate according to the circumstances of the times, and require constant supervision and alteration. As far as is known at present, some twenty different States will be represented at the St. Petersburg Conference.

BORN.

DAVY.—At Shreve, O., Sept. 8, 1874, to J. V. Davy, Manager W. U. Telegraph Office, a son.

WEBB.—At Moorehead City, N. C., Aug. 25, 1874, to A. H. Webb, Manager W. U. Telegraph Office, a son.

MARRIED.

COROLTON—WHITE.—At Greencastle, Ind., Sept. 17, 1874, by Rev. James S. Gillespie, Henry W. Corolton, Assistant Train Dispatcher, Indianapolis and St. Louis R. R., Mattoon, Ill., to Miss Emma F. White of Greencastle.

MURRAY—FOSTER.—At Edgebrook, Botetout Co., Va., Aug. 19, 1874, by Rev. P. L. Fellows, Kenton C. Murray, Manager S. and A. Tel. Co., Mobile, Ala., to Miss Ada B. Foster of Edgebrook.

PINDAR—SALPAUGH.—At Hudson, N. Y., Aug. 4, 1874, Wm. H. Pindar, Manager W. U. Telegraph Office, Tivoli, N. Y., to Miss Mary E. Salpaugh of Catskill.

SYLVESTER—CHURCH.—At Ceylon, O., Sept. 19, 1874, W. W. Sylvester, Operator and Agent, to Miss Ella Church, formerly night operator at Ceylon. No cards.

DIED.

MOFFETT.—At Union City, Tenn., Aug. 23, 1874, Jessie Estelle, daughter of Frank G. Moffett, Hearne, Texas, Office, aged 3 years and 23 days.

Journal of the Telegraph.

This Journal is issued on the 1st and 15th of each month. Its circulation is over 8,000. It goes to every State, Territory and Province on the Continent. It has become a necessity, and is always welcomed as a friend. No better medium for advertising exists.

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Address—

JOURNAL OF THE TELEGRAPH,

Western Union Telegraph Company,

145 Broadway, New York.

NEW YORK, OCTOBER 1, 1874.

THE Annual Meeting of the Stockholders of the Western Union Telegraph Company will take place on Wednesday, October 14th, at twelve o'clock, noon, at the General Office of the Company, 145 Broadway, New York.

MANY offices check for other lines, in their check reports, an amount greater than they take credit for as paid other lines in their accounts current, because of special deliveries occasionally made without cost, postages paid with stamps on hand, or for other reasons.

The amount for paid other lines in the one report should always be the same as the amount checked for other lines in the other report, and credit should then be given as an item of sundry receipts for any surplus, stating specifically what it consists of.

WE surrender a large space in this issue to the opening portion of the argument of Mr. Grosvenor P. Lowrey before the Committee on Appropriations of the House of Representatives upon the Postal Telegraph bill of Mr. Gardiner G. Hubbard, which was under consideration during the last session of Congress. The subject is well discussed, and there are many points in Mr. Lowrey's argument which are new and will prove interesting to those who desire to keep well posted in regard to the attempts at spoliation which are so persistently urged at every sitting of Congress under the specious plea of affording cheaper telegraphing for the people.

MR. GERRITT SMITH, for many years one of the chief operators attached to the General Office of the Western Union Company in New York, has been appointed Assistant to the Electrician of the Company. He is succeeded in his former position by Mr. John H. Dwight, formerly Manager of the Albany, N. Y., office.

EMPLOYÉS of the Western Union Company should bear in mind that they can be supplied with the JOURNAL at the old rate of subscription, one dollar per year. This opportunity for obtaining information and instruction so valuable to the telegraphist should not be neglected.

DUPLEX AND QUADRUPLIX TELEGRAPHY.

We publish in this issue an article written by Arthur R. Granville for the *Telegraphic Journal*, on Duplex and Quadruplex Telegraphy, wherein the writer conjectures that our quadruplex system is the result of a combination of Stearns' Duplex with Stark's method of sending two messages along a single wire in the same direction. A description of Stark's device, copied from Sabine's History and Progress of Telegraphy, was published in our last issue, and if the reader will take the trouble to refer to it he will see at once that the plan there described and illustrated is entirely impractical. This plan provides for two relays in circuit at the receiving station to be operated by batteries of different potentials—one, for example, to be affected only by a current from 100 cells, and the other by one of 50 cells. The relay worked by the 50 cell battery has an extra coil connected with a local battery, the circuit of which is closed by the repeating points upon the less sensitive relay. The supposition of the inventor is that when the signals are sent from the 50 cell battery, the sensitive relay only will respond, and that when the signals are sent from the 100 cell battery, that the less sensitive relay will respond and close the repeating points, which will send a compensating current through the extra coil of the sensitive relay, and thus prevent its working. Now, of course, the relay which is adjusted for 50 cells would respond quicker to the 100 cells than the relay which is supposed to charge, attract its lever, and send a current through the equating portion of the more sensitive relay to prevent its responding. We need hardly say that the quadruplex is indebted for none of its parts or principles to Mr. Stark's device.

Mr. Granville's allusion to Mr. Stearns' great invention of the Duplex Telegraph, while no doubt intended to be fair, and perhaps even generous, does not by any means do him justice, and we hope soon to be able to spare the necessary time for a thorough discussion of what Mr. Stearns has done and what others had done previously for Duplex Telegraphy. While we cannot but be pleased with the allusion made to the ingenuity and enterprise manifested by the Americans in electrical matters, we are compelled to say that we do not think the discoveries of any inventor ought to be claimed for the country in which he happens to live or to have been born. Science is not confined to any country, but is universal, and the reason why there are more inventors in one country than another, we apprehend, is due rather to the situation and necessities of the inhabitants of each than to any superior natural endowments possessed by the people.

Necessity, it is truly said, is the mother of invention; and we were absolutely compelled by our very urgent necessities to make these great discoveries. With a white population but a little more than that of the United Kingdom, the territory of the United States is nearly as great as that of all Europe outside of Russia, and we were expected to furnish for this comparatively sparse population, spread over this

immense expanse of territory, a telegraphic system as complete, rapid and cheap as that of the most favored country in Europe. On the one hand, unscrupulous politicians, eager for power and place, were seeking by all means, good, bad and indifferent, to catch us in a Government net, and make of the telegraph one more spoil, to be divided among the victors of the periodical elections. On the other hand, greedy and unscrupulous speculators were seeking to induce Congress to give them the means for the spoliation of the telegraphs of the country, under the specious plea of furnishing cheaper telegraphic correspondence for the people by a union of the telegraph and the post-office. Now, in order to afford no just ground for complaint, or rather to afford these schemers no ground at all upon which to make an attack upon us, the Western Union Company has for years past devoted its revenues to the construction of new lines—putting up an average of about 20,000 miles of wire per annum—and has freely given the public the advantage of them in reduced rates. Since 1868 the average rate per message upon the Western Union lines has been reduced from \$1.10 to 53 cents, while the number of messages transmitted annually has increased from five to sixteen million. There is no country in the world which approaches us in the extent of our lines, wires and offices, and none, with the exception of Great Britain, which approaches us in the amount of our annual traffic. Compare, now, what we are required to do to bring our cities into instantaneous communication with each other, with what is demanded of the English for a similar purpose. Between England's metropolis and the chief provincial towns the distance is so small as to seem to us quite insignificant. From London to eleven of the principal cities in England, Scotland and Ireland the air-line distances are as follows:

	Miles.
Birmingham	100
Brighton	47
Cardiff	129
Hull	150
Liverpool	210
Manchester	163
Newcastle on Tyne	245
York	176
Dublin	285
Edinburgh	325
Glasgow	340
	2168

From New York to eleven of the principal cities in the United States, the air line distances are as follows:

	Miles.
Boston	231
Buffalo	423
Charleston	813
Chicago	898
Cincinnati	744
Indianapolis	812
Milwaukee	1,103
New Orleans	1,493
Philadelphia	88
San Francisco	3,303
St. Louis	1,090

10,984

The average distance from London to the eleven largest telegraph stations in Great Britain is about

200 miles. The average distance from New York to the cloven largest telegraph stations in the United States is about 1,000 miles. The greatest distance between any two telegraph offices in the United Kingdom is about 800 miles. The greatest distance between any two Western Union offices is about 6,000 miles.

A private company could not, of course, devote its income forever to the construction of additional lines between these distant sections for the sole benefit of the public. Stockholders have a right to expect a fair return for their investments, and hence some other plan had to be found for increasing the facilities for the transmission of the rapidly increasing traffic of the Western Union lines, less expensive than that of duplicating the wires by construction.

Fortunately this want was for a time met by the Duplex, but, as the traffic increased, still more facilities were demanded, and the necessities of the case required an invention giving even greater results. This necessity is met with the Quadruplex, an American invention, it is true, but not necessarily made in this country because we possess greater scientific knowledge or inventive genius, but because the necessities of our traffic required it, and experience seems to prove that whatever is required will be produced.

The Quadruplex is now in successful operation between New York and Boston, and will soon be established between other important cities.

THE SOLUTION OF A CURIOUS QUESTION.

A RATHER cute but not over scrupulous descendant of Torah recently turned up in a western city, and succeeded, by "his tricks and his manners," in accomplishing a feat more worthy of the brother of the "cunning hunter" who disposed of his inheritance for a dish of lentiles, than of his more ancient ancestor who once upon a time made and sold molten images in the venerable but idolatrous old town of Uz, but who, at a ripe old age, sold out his business, pulled up stakes, and started for distant parts to begin a new and better life—the said feat being the presentation of a dispatch at one of our offices for transmission to a distant place, written in what to the manager was an unknown tongue, but which was said by the sender to be Hebrew. Now, the very generous rules of the Western Union Company permit the patrons of the line to send their messages in any language they please, without extra charge, provided they are not written in an arbitrary cipher. They even admit of their sending in cipher at ordinary rates, provided the cipher is composed of ordinary English words. This dispatch, therefore, if written in good honest Hebrew, was undoubtedly entitled to be sent at regular rates, even though the operators spent double the time required to send an ordinary English message, in accurately translating its fearfully constructed words. However, there was a doubting Thomas somewhere along on the line, who didn't believe the message was correctly

checked [there generally is one of those doubting chaps somewhere about, and he often does a mighty sight of good, either by nosing out a fraud or making the truth more obvious], and so a discussion arose as to whether the message contained 10 words or 95 words—that is to say, whether it was to be counted by the word as an ordinary message, or by the letter as a cipher message. The discussion was ably carried on, and very creditable points were made on all sides. It was generally conceded, however, that a communication written in an unknown language, composed of the worst jaw-breaking words conceivable, and containing 95 letters, ought not to be sent as a simple 10-word message; but then there was the rule providing that "Cipher messages, composed of simple English words in ordinary use will be transmitted at usual tariff rates. All other messages in cipher, whether composed wholly or in part of figures or arbitrary combinations of letters or words of any foreign language, *when used as a cipher*, will be estimated by counting each letter or figure as a word." Thus implying that messages written in a foreign language could go at the usual rates; and this was apparently written in a foreign language, as much entitled under the rules to go as a simple message as if written in German or French. One ingenious critic thought it might be got around by claiming that it was written in a dead language, and that the rule did not permit of messages written in a dead language being transmitted without extra charge; but there were two difficulties in the way here—first, the Hebrew language can hardly be said to be a dead language when it is generally spoken by so lively and numerous a race as the Jews, and second, the book of rules doesn't make any discrimination about the matter at all, and is apparently totally unconcerned whether the language be a live or dead one, so far as the rates are concerned.

In this stage of the matter it was happily referred to us for our consideration. We say happily because, as the message was said to be written in Hebrew, it was absolutely essential that it should be considered by some one competent to read, mark, learn, and inwardly digest its contents, to be sure that such was the fact. Now, we have never considered it quite proper for us to boast of our acquirements, either in a scientific or literary point of view, as some of our cotemporaries do, but we feel compelled to acknowledge that in this case our qualifications were ample for the occasion, for without stopping to consider whether we shall be thought to be egotistical or not, we have no hesitation in saying that our knowledge of Hebrew is fully equal—we will not say superior—to that of the Sanscrit, Chaldee, or any other ancient Asiatic tongue. We feel that we ought to stop a moment here to congratulate ourselves upon the great benefits which a knowledge of these ancient tongues has so unexpectedly bestowed upon us, but we cannot spare the time, however praiseworthy the desire. We must hasten to the conclusion of our story. When we had fastened our scrutinizing gaze upon these wonderful words of most unheard-of

length, we were surprised to find that there was not a syllable of Hebrew among them! We then thought us of our Sanscrit, but they were totally *sans* any scrit of that ancient tongue. We then tried Japanese—ancient and modern—Hungarian, Bohemian, and even the "Heathen Chinese," with the same result. We then remembered a singular language that we had learned many years ago, but never had had occasion to use before, having learned it more from a spirit of curiosity than from any other motive, and we suddenly determined to try this wonderful message by the rules of this singular and now almost forgotten language, and see if we could not make it speak to us words of intelligence which should unravel the mystery. The name of this curious language is Rehpigubmuh, and its distinguishing peculiarities lie in its freedom of construction, which admits of its conveying three or four times as much information in the same number of words as that of any other language, either dead or alive, and in the fact that like Hebrew it has to be read from left to right instead of from right to left, as with most modern languages. This, however, is the only characteristic which it possesses in common with the ancient and honored tongues spoken by Abraham and the Prophets, for the strange jargon in which this message was written was never spoken by any seer, sage or prophet—in fact it was never spoken by anybody—but is simply and entirely a written language, and when any profit is involved in its use, the orthography of the name differs from the biblical standard. The word which gave us the key to this message was the following: tnegashtimallib, which, if read from left to right, will not only reveal the tap-root of the language employed, but will show where the profit is when using it and getting three words sent for one.

Now, all receiving clerks can scarcely be expected to understand all foreign languages, and are therefore to be excused if they are sometimes deceived by a trick like this, but we think, as a rule, that the exercise of a little common sense will guide them to a proper decision in such cases. Words of any genuine language should rarely exceed five letters, and when a message is offered for transmission which is ostensibly written in a foreign language, and contains an average of nine letters each, the presumption that it is in cipher is sufficiently strong to warrant the imposition of cipher rates.

WATERPROOF GLUE.—Bichromate of potassa has the property of rendering insoluble, under the influence of light, certain organic bodies, such as gum, glue, glycerin, &c. If a paper covered with gum mixed with bichromate is exposed to light, the coating becomes quite insoluble even in boiling water. This property is utilized in the so-called "carbon" photographic process. Strong glue becomes insoluble more rapidly than gum, and the action takes place slowly even in the dark. A concentrated solution of bichromate is prepared, which is kept in the dark, and a little of which is added to boiled gelatin. Objects glued with this, after some time, can be washed either with cold or hot water.

CORRESPONDENCE.

DUBUQUE, Ia., Sept. 20, 1874.

To the Editor of the Journal of the Telegraph:

A few days since a message was received at this office with signature prefaced by word "Rev." The body of the message was composed of twelve words, and check so given. I claimed thirteen words, counting word "Rev." as an extra word; claim was not allowed, because the word "Rev." didn't follow signature. Executive order No. 150, August 18, 1872, says, titles, &c., following signatures must be counted. Why, then, shouldn't we count them, when they head the signature? Should it be allowed because they do so? If so, a cashier could sign his name "Cashier" John Smith, or "Prest." Chas. Jones, and be allowed; all are titles, all the difference is that a church confers one, and a bank the other. Another thing, why should word Jr. after a signature, like Chas. Williams, Jr., be counted? That is part of a man's name, just as much as Williams, and I cannot see why it should be counted as an extra word, as I have known it to be.

A. CRARY.

Answer.—Any title attached to a signature should be charged for, whether a prefix or suffix. The appellations junior and senior are in general use as portions of names, and consequently they should not be charged for.

DELPHI, Ind., Sept. 14, 1874.

To the Editor of the Journal of the Telegraph:

Suppose a case. A message is received collect and calls for answer, for A. B., who lives two miles in the country. Messenger is instructed to tell him that his answer must be prepaid. Notwithstanding this, the message boy brings it back with instructions to send collect. Cannot notify A. B. that answers to collect messages must be prepaid. Now, am I allowed to ask the sending office if he can collect the answer there? This happened to-day, and this is what I did. Please answer through the JOURNAL.

C. H. LINDENBERGER.

Answer.—If the messenger informed A. B. that the answer must be prepaid, and if such was the actual fact, you should not forward the message collect. The office message mentioned should not have been sent. But it appears to us that the answer might properly have been sent collect. The responsibility for the tolls would rest with the office sending the first message, which should have been prepaid.

To the Editor of the Journal of the Telegraph:

Please give me your opinion on following: Suppose a party comes to office and telegraphs for a coffin. In a short time another party comes in and asks me whether I have sent any message in regard to coffin. Is it my business to tell him yes, or that it is not my business to say anything about messages sent, as all messages are sacred. Please answer in next JOURNAL, and oblige

P. U. OFFICE.

Answer.—You should courteously inform the inquirer that you can give him no information whatever concerning messages which may have been left with you by other parties.

LOCKPORT, Ill., Sept. 2, 1874.

To the Editor of the Journal of the Telegraph:

Party sends a message from here to Chicago. Chicago sends for better address, saying he has been to three different places with this message. I notify party sending it, and he gives an entirely different address. I refuse to send it unless he pays tariff rate on the message. Am I right or wrong? Please advise through JOURNAL, and oblige

H. O. X. Q.

Answer.—You are right.

BALTIMORE, Sept. 21, 1874.

To the Editor of the Journal of the Telegraph:

The problem over the signature of X. Y. in JOURNAL of January 1st, 1874, is as follows: Two wires are crossed between stations A and B. The resistance of the first wire between "A" and the cross is 3,000 ohms, and between the cross and "B" 2,000. The resistance of the second wire between "A" and the cross is 1,000 ohms, and between the cross and "B" 4,000. The resistance of the cross itself is 1,000. Find the combined resistance of the two wires from "A" to "B."

I first find the combined resistance of the two wires, from "A" to the cross, which, by rule, is

$$\frac{3,000 \times 1,000}{3,000 + 1,000} = 750$$

To this I add the resistance of the cross 1,000 + 750 = 1,750. Then find the combined resistance from the cross to "B."

$$\frac{2,000 \times 4,000}{2,000 + 4,000} = 1,333$$

To this add the combined resistance already found, we have 1,750 + 1,333 = 3,083. 3,083 is the combined resistance of the two wires from A to B. "V."

Comment.—This solution is obviously incorrect. The resistance of the wires being 5,000 ohms each, the combined resistance is evidently 2,500, when not crossed. Of course, whatever other effect the cross might have, it could not increase the total resistance between A and B.

To the Editor of the Journal of the Telegraph:

A. comes to my office and sends a message to B., which requires an answer. Message goes through repeating office. A few days after A. and B. call at my office. A. asks why I did not send his message that he left here a few days ago for B. I say I did. B. says there must be something wrong, as he did not receive it. I then send an office message to receiving office to know if he delivered my message, giving date, address, &c., and make it D. H. Manager repeating office says: "You must give check and make it paid." Says I: "It's D. H." Repeating office won't receive it unless I make it paid. Now, what I want to know is this: 1st. Was I right in making it D. H.? 2d. Has any repeating office the right to dictate to sending office what is to be paid or D. H.? 3d. Is it not the duty of a receiving office, when a message cannot be delivered, to notify sending office of same, which was not done in this case? J. G. H.

Answer.—1st. The office message should have been paid for. It does not follow, because B. failed to get the message sent by A., that the Company was at fault. The manager of the sending office should, however, have promised A. to investigate the matter by mail, but if A. or B. wished the investigation to be made by telegraph they should have paid for the messages of inquiry, subject to a refunding of the tolls in case the Company was at fault.

2d. The action of the repeating office was right in informing you of your error in sending the message of inquiry free, but he was not authorized to stop the message. The only instances where repeating offices are authorized to stop messages are where they are checked "D. H., no account," or bear other evidence of an intention to violate the rules and prevent proper returns. It was his duty to forward the message and report the facts to his Superintendent, as provided in Rule 20.

3d. It is the duty of a receiving office, when a message cannot be delivered, to notify the sending office, and this duty is specifically enjoined upon the delivery clerk of such office by Rule 53.

To the Editor of the Journal of the Telegraph:

Suppose a party sends a paid message to a party holding a frank, and the latter answers "D. H. frank." Should I not collect tariff, and enter it so on my books? Please answer in next JOURNAL.

ARKANSAS.

Answer.—You do not state the case with sufficient clearness for us to thoroughly understand it. If to the answer to the paid message a proper stamp was affixed or frank shown, it was undoubtedly your duty to send it free. A frank covers the transmission of an answer to a paid message as well as an original dispatch.

F. B. A.—Yes; a relay of about 150 ohms would be best for your circuit of 250 miles. There is no propriety in using relays of less than 100 ohms upon circuits of that length.

F. E. M.—Cannot be one word.

Disputant.—There are five words in "Has steamer San Salvador left?"

F.—There are fourteen words in "Put our whiffletrees and your jackscrews outside the mill door. Coming after raft to-night." Whiffletrees and jackscrews are each one word.

GOLD AND STOCK TELEGRAPH CO.
ANNUAL MEETING.

The regular annual meeting of the Gold and Stock Telegraph Company was held on Tuesday, Sept. 22; to elect Directors for the ensuing year. The following ticket was elected: For Directors—Marshall Leferts, William Orton, A. B. Cornell, George B. Prescott, James H. Banker, George H. Mumford, Norvin Green, Tracy R. Edson, Henry Pierson. For Inspectors of Election—John H. Fisher, Cambridge Livingston, W. H. Abel. The Company's earnings and expenses for the fiscal year ending Sept. 18, 1874, were:

From gold and stock instruments.....	\$140,000
Private line instruments.....	68,000
Private line instruments in country.....	82,000
Commercial news department, city.....	50,000
Commercial news department, country.....	275,000
Sundry earnings.....	16,000
Gross earnings.....	\$581,000
Operating expenses.....	419,000
Net earnings.....	\$162,000

During last four years out of net earnings the Company has expended on lines and instruments the following amounts:

1871.....	\$58,420	1874.....	\$142,970
1872.....	292,160		
1873.....	216,175	Total.....	\$709,795

At a meeting of the Board of Directors, on Thursday, Sept. 24th, the following named gentlemen were elected officers for the ensuing year: President, Marshall Leferts; Vice-President, George B. Prescott; Secretary and Treasurer, Henry H. Ward.

STRATIFICATIONS OF ELECTRIC LIGHT.—*M. Noy-reneuf.*—Stratifications of the electric light may be obtained under the following circumstances, which render it possible to produce with static electricity inversions of charges as rapid as those given by the use of Ruhmkorff's coil: Suppose the two condensers of Holtz's machine connected by a Geissler tube instead of communicating by a continuous piece of sheet metal. The machine is then arranged so as to give small sparks, succeeding each other with great rapidity. Two inverse currents will then traverse the Geissler tube, showing very distinct stratification. In order to succeed, even with very long and wide tubes, it is necessary to replace the ordinary small bottles with jars of great size. Those which the author employed had 1873 square centimetres of surface.

JOURNAL OF THE TELEGRAPH.

VOL. VII. NO. 20.

NEW YORK, OCTOBER 15, 1874.

WHOLE NO. 167.

THE HUGHES PRINTING TELEGRAPH.

[Translated from Schellen's *Elektromagnetische Telegraph.*]

(Continued from Page 291.)

THE WHEELWORK AND THE TYPE WHEEL AXIS.

Figures 1 and 7 are views, in perspective, of the Hughes apparatus complete. Figure 8 represents the same looking downward at the top.

In front is the key-board of twenty-eight keys. At the back of this the covering plate of the box A, with the twenty-eight pins, in the center of which is the vertical axis Q and the sledge S, which is rotated by means of a beveled gear (Figure 4), and which revolves twice in one second of time. Behind the box A is a strong iron frame, which serves as a bed for the different wheels. The first wheel, T, is actuated by a weight of 100 pounds. This weight hangs on a double chain, with links, in such a manner that, when it is pulled up, the revolving wheelwork is not interrupted or retarded. The pulling up is usually done by means of a pedal, every five or ten minutes, on account of the exceedingly rapid motion of the wheelwork. Wheel M turns with wheel T, and this motion, multiplied, is conveyed to wheel

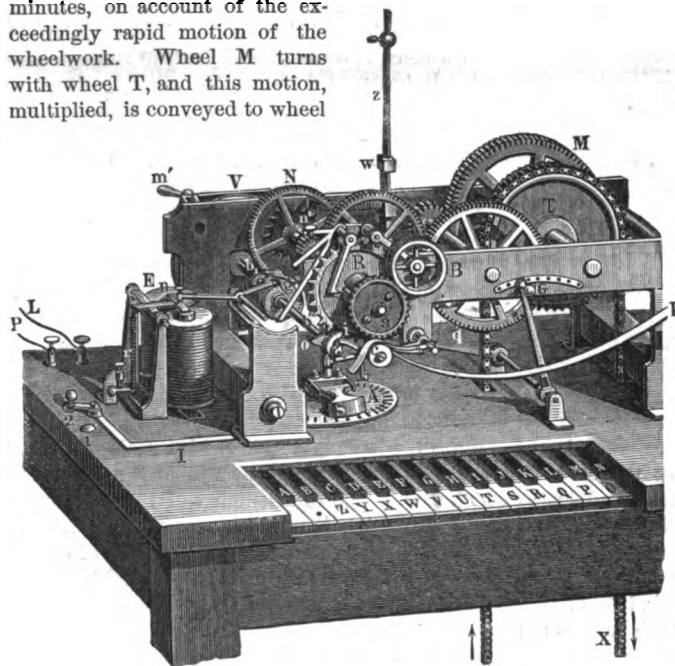


Figure 7.

N. The latter puts a fly-wheel, V, in motion, on which, by means of a handle *m'* a brake is operated for the purpose of stopping the instrument. Wheel N also actuates a somewhat deeper lying gear, 5, (behind *g*, Figure 8), and so conveys its movement to the printing axis *b*, the operation of which will be described hereafter.

In front, on the axis of the wheel N (*a' a'*, Figure 8), which passes through the front plate of the frame, a concave axis is placed, which unites wheels *a* and R. This axis is carried by a small friction. Wheel *a* is the type wheel (Figures 7 and 9), on the circumference of which are twenty-seven teeth of hard steel, and one blank space. Twenty-six of these

carry the different letters of the alphabet, and one is a point for a stop or period. B is the ink-roller, pressing against the face of the types, and revolving with the wheel. R is the correcting wheel, whose connection with *a* and the entire portion of the apparatus is clearly described in Figure 9. Upon the axis which connects wheels R and *a*, a steel disc F is placed, which is provided with a latch, in order to catch the hook of a lever, K, when the latter is pressed against the steel disc by the depression of the button or key *n'*. When this takes place, and the hook of the lever K catches in the latch F, the empty space of the type wheel stands exactly over the impression roller *c*, which carries the slip of paper. Thus whilst the apparatus is in motion, and the key *n'* is depressed, the lever K falls into the latch F and stops wheels R and *a*. This places the blank

and, in so doing, lifts the 'catch' out of the teeth of wheel *a*. So long as the key *n'* remains depressed there is no connection between wheel *a* or axis *a' a'* and the wheels R and *a*. As soon as the tooth of the lever K catches the latch F, R and *a* stop, whilst the remainder of the apparatus continues in motion without interruption.

In order to correctly understand what now follows, the circumstance that (see Figures 3 and 8) axis *a' a'* not only turns the type wheel and the correcting wheel, but by means of a beveled gear G, also the wheel *f*, its axis Q (Figure 4) and the sledge S, is of great importance. This result is attained in this way, that the sledge S and the type wheel *a* cannot

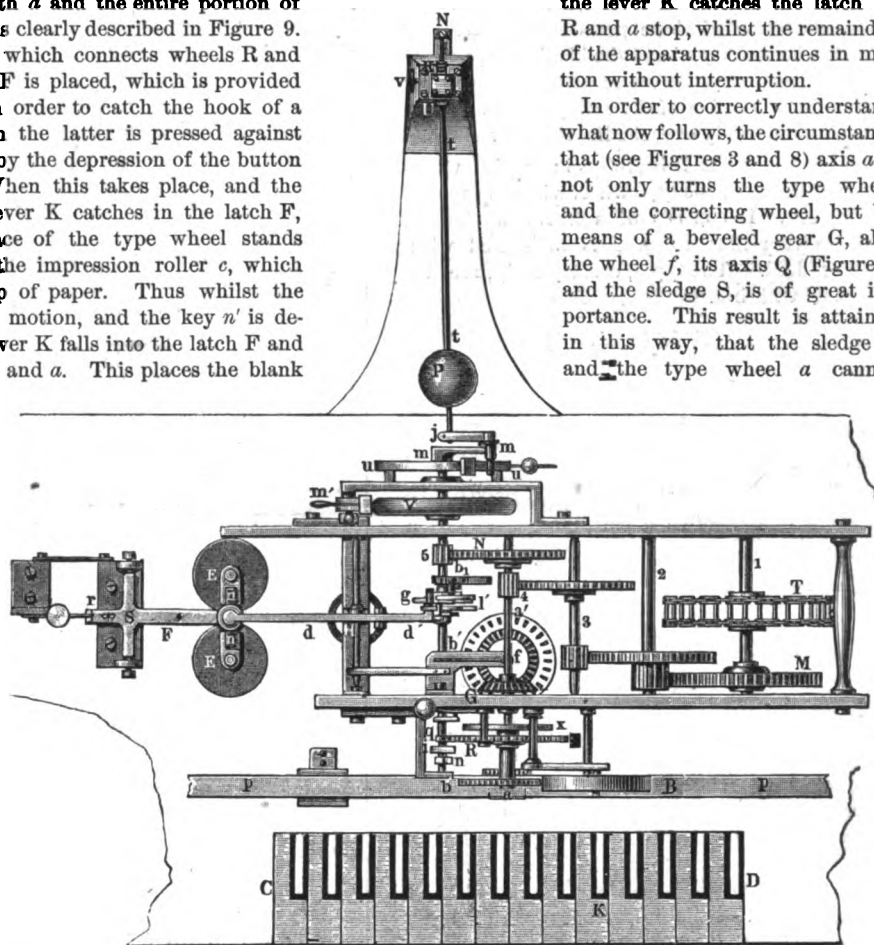


Figure 8.

upon the type wheel against the impression roller *c*. In order to prevent axis *a' a'* and the remainder of the work from stopping when the motion of R and *a* is arrested, those parts are connected to each other by

means of a movable coupling, in the following manner: Upon the axis *a' a'*, behind the correcting wheel R (Figure 8), is another wheel, *z*, with very fine teeth. On the back of the correcting wheel is a ratchet with three teeth, which, under the action of a detent, catches in the teeth of the wheel *z*. In this position, by means of the wheel *z* and the catching teeth, axis *a' a'* must communicate its motion to the correcting wheel R, and by that to the type wheel. Upon the tri-dented catch of the correcting wheel is also a small pivot, which ordinarily passes the coupling with tooth wheel *z*, on plate S (Figure 9). Should key *n'* be depressed, the arm I pushes the plate S forward so that the pivot strikes against it,

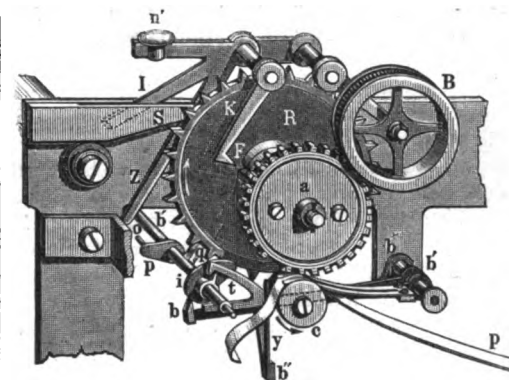


Figure 9.

move independently of each other, but rather rotate with equal angular velocity, thus always remaining in harmony with each other in the same relative position. Their primitive position, how-

ever, is such, that at the same time that the contact disc S S (Figure 5) of the sledge comes into contact with the pin *k* of a depressed key, the letter upon the type wheel which is represented by this key is exactly opposite the impression roller *c* (Figure 9).

When, for instance, the key for the letter H is depressed, the rotating sledge brings the contact disc S S on the pin which corresponds with this key, and as the type wheel and pin disc A A have the same graduations, and through the wheelwork the type wheel and the sledge turn with equal angular velocity, the letter H upon the type wheel will be found immediately over the impression roller *c*. The adverse position of both should be kept up during the activity of the apparatus, at least so long as the permanent connection of wheel *a* with axis *a'*, through tooth wheel *x*, remains. The harmonious action of these parts is, however, always effected by the key *n'* and the blank or space key of the key-board, because the result of the depression of key *n'* is the placing of the empty space on the type wheel immediately over the impression roller *c*.

The inking roller B is always in contact with the circumference of the type wheel when the apparatus is at work. It consists of a heavy woollen cloth, which from time to time is moistened with an inking fluid. The types, consequently, are always supplied with ink.

(To be Continued.)

TELEGRAPHS IN ARMY OPERATIONS.

Gen. W. T. Sherman has written some "Recollections" of our great war in which he played so conspicuous and effective a part, the latter portion of which has been published, and from this we extract the following on the use of telegraphs in our campaigns:

"For the rapid transmission of orders in an army covering a large space of ground, the magnetic telegraph is far the best, though habitually the paper and pencil, with good mounted orderlies, answers every purpose. I have little faith in the signal service by flags and torches, though we always used them, because almost invariably when they were most needed the view was cut off by intervening trees or by mists and fogs. There was one notable instance in my experience when the signal flags carried a message of vital importance over the heads of Hood's army, which had interposed between me and Alatoona, and broken the telegraph wires—as recorded in my 'Recollections'—but the value of the magnetic telegraph in war cannot be exaggerated, as was illustrated by the perfect concert of action between the armies in Virginia and in Georgia in all 1864. Hardly a day intervened when Gen. Grant did not know the exact state of facts with me, more than 1,500 miles off as the wires ran. So, on the field a thin insulated wire may be run on improvised stakes, or from tree to tree, for six or more miles in a couple of hours, and I have seen operators so skillful that by cutting the wires they would receive a message with their tongues from a distant station. As a matter of course, the ordinary commercial wires along the railways form the usual telegraph lines for an army, and these are easily repaired and extended as the army advances, but each army and wing should have a small corps of skilled men to put up the field wire and take it down when done. This is far better than the signal flags and torches. Our commercial telegraph lines will always supply for war enough skilled operators."

REPORT ON THE TELEGRAPHIC SYSTEM OF GREAT BRITAIN.

By R. S. CULLEY, CHIEF ENGINEER OF THE BRITISH TELEGRAPHS.

[Translated from the *Journal Telegraphique*.]

I.—BATTERIES.

The batteries used in Great Britain are those of Daniell and Leclanché.

A special battery is used for each circuit, except when the wires are short, and of nearly equal resistances.

When it is essential that the battery be portable, the following modification of Daniell's battery is made use of, which has proved to be economical and efficacious. A teak-wood trough with a cover, is divided in compartments by means of glass or slate plates, well coated with marine glue. The compartments are subdivided by a plate of porous china $\frac{1}{16}$ th of an inch. The plates are made of cast zinc, 4 inches in height and 2 inches in width, and of thin brass 4 square inches. A copper band is welded to the zinc plate and riveted to the copper one; the extreme end, (which is soldered to the zinc plate,) having been previously tinned for the purpose of making the contact perfect.

The zinc is suspended in the upper part of the compartment, which is filled with a diluted solution of sulphate of zinc.

The compartment in which the copper plate is suspended is filled with a solution saturated with sulphate of copper, and crystals of this salt, of the size of a small nut, are put at the bottom. The annual consumption of sulphate of copper is about $1\frac{1}{2}$ pounds to each element.

When it is not necessary that the battery should be portable, these same elements are put up separately in ebony rectangular compartments. The diaphragm is formed by means of a rectangular porous vessel.

For cable circuits and for the interior circuits, when the Wheatstone's automatic apparatus is used, it is desirable to decrease the interior resistance of the Daniell's elements. For this purpose ordinary cylindrical vessels are made use of.

The large model, Leclanché battery, has also been used in some cases on the aforesaid circuits, and its use will probably become general.

For the smaller offices, which do not transmit a great many messages, the small model of Leclanché battery has been judged more useful, as this battery may be left to itself for several weeks and even several months, without serious loss from evaporation.

On the circuits, whose insulation is defective, which, however, are but few in number, it has been admitted that the best remedy against this fault is to increase the size of the elements rather than their number.

The zincs are not amalgamated, but great care is taken that they do not contain any portion of lead or iron.

The sulphate of copper is of considerable purity, and is specially manufactured for the use of this Department. It is stipulated that the crystals shall not be larger in size than a small hazel nut. Owing to this it is never necessary to crush them, and their demolition is effected easily and uniformly.

2.—INSTRUMENTS.

In consequence of the short time that has elapsed since the British Post Department have had charge of the Telegraph, each Company having had a system of transmission of their own, there are still in use too large a variety of instruments. The Morse ap-

paratus, having been perfected by Messrs. Siemens, is more extensively used. The Siemens relay may be used if necessary.

In the village post-offices, where it would be impossible to have the service performed by experienced employes, the Wheatstone Single Needle or Dial Electro-Magnetic apparatus is used.

The use of Hughes' apparatus is still very restricted, but its extension is proposed.

The Wheatstone automatic apparatus, which performs an enormous deal of work, is fast increasing.

The longest circuits are from London to Cork, and from London to Aberdeen, which is 430 to 560 miles respectively. Those circuits are easily and regularly worked with a single line current, regardless of temperature and without requiring any relay.

Messages for the interior generally contain about 40 words. One hundred and fifty of these messages have been sent on a single wire, from London to Manchester, in one hour.

The automatic system is more especially adapted for the transmission of press despatches. The tolls being very moderate, a great deal of press matter is transmitted by telegraph and distributed between the principal cities.

Each of the wires connected with this service forms an omnibus circuit, working sometimes as many as six offices, and advantage is taken of the systems of translation and bifurcation to connect these omnibus wires with more remote wires.

The instruments for transmission in the Central Office at London, are put up side by side, and the perforated paper band successively passes through each of them. After passing a short distance through apparatus No. 1, it reaches No. 2 from whence it starts to pass through No. 3, and so on till it has passed through the last apparatus of the series. Between each apparatus a sufficient length of paper band is given in order to take account of the differences which are made in the rapidity of transmission.

A particular arrangement is made for the Morse instrument. The signals are not caused by positive or negative currents, always issued in the same direction, and followed by an interruption, but by reverse currents, one of which attracts the lever of the relay against the working-contact and the other calls it back and keeps it on the resting-contact.

Consequently the wire is continually occupied by the current.

When the wire is free, in the intervals which separate the transmitting of the signals, there is a limit, which the degree of sensibility of the relay ought not to exceed, because, if it was very sensible, it would be affected by the smallest leakage of current from the neighboring circuits, and produce false signals. But when the wire is used by a reverse current, during the pauses which follow each signal, this limit does not exist any longer, and an instrument delicate enough to acknowledge the signals proceeding from the leakage of the currents from the other wires, however, would precisely reproduce all the signals transmitted on its own wire. If the current which occupies the wire in the intervals which separate the signals from each other, has the same direction as the reverse current, it will help the latter to retain the lever of the relay. If it is produced in the same direction as the direct current, then it could not make the relay move, unless it were powerful enough to neutralize the reverse current.

Experience has shown that defective wires which could not be worked without much difficulty and uncertainty by means of the ordinary system, can be worked very safely by means of the double current.

In practice, the single current is used only for circuits which are not more than 120 miles long. The longer circuits, it is true, may operate regularly by means of this system, when the weather is fine, but they work hard as soon as the air is damp. On the contrary, they very seldom get out of order when use is made of the double current.

The advantage of the double current system has been particularly noticed on a large number of the imperfectly insulated wires that were transferred, which had been previously worked on the single-current system. The changing of systems has rendered useful wires which had previously been abandoned.

Every office is provided with testing-boxes, where the wires are brought in and connected together by means of thumb screws. By this system an apparatus can be easily changed from one wire to another, also equally facilitating the change of circuits that are frequently required.

The main offices are all provided with resistance-coils and galvanometers.

3.—GROUND WIRES.

I beg to call especial attention to another arrangement, which I believe is used only in Great Britain. It is that of *ground wires for the prevention of a mixture of currents.*

When a current goes to earth the signals are only weakened, and the loss can be recovered by increasing the power of the battery. But when it escapes on *any other wire* it confuses the signals, which are transmitted on this wire, and when the signals are sent on the second wire, then the current counteracts those which pass on the former.

When the power of the battery is increased in order to compensate for the loss of current, the mixture is equally increased. The derivation of current from one wire to another is an inconvenience a great deal greater than the loss of the current from a wire to earth.

There is consequently a substantial advantage in being able to intercept the leakage of current, and to conduct them to earth, by putting an iron wire between two conductors. It is true that the signals are weakened; but this loss can be compensated for by an increase of strength in the battery, without troubling the working of the other wires put up on the same pole. In order to get at a better result, these ground wires ought to be soldered to the screw-nuts of the isolator, or to the iron support on which this is attached, and which for this purpose is provided with an iron pin. The ground wire ought to be fixed to the support, after the latter has been attached to the pole, and it is a great deal easier to solder it to the small iron pin than to the bulk of the support. When the wires are not soldered to the screws of the isolator, they should by all means be solidly screwed in between the screw-nut and the round.

Starting from the main wire attached on the sides of the pole are bifurcating sections of ligature wires, which are further up connected with the different insulators.

When wooden cross-pieces are made use of, and it is deemed useful not to lose the insulation furnished by the wood, then the ground wires may be rolled up very close around the support, or buried in the furrow, but they ought to be placed as near as possible to the pole, so that when a wire falls down on the support it cannot touch them. They are solidly screwed between the head of the pin, by means of which the support is attached to the pole and its round, so that the current, which escapes across the wood, may be conducted to earth, as well as that

which passes on its surface. It is evident that the wire ought not to be coated with varnish, nor with tar. This method is not as efficacious as the former, and the property for insulation of the wood is not of great benefit when the weather is damp.

When on top of the pole there is but a single wire it is not necessary, and even not beneficial, to place a ground wire, as the derivations of the current cannot pass into the other wires; they get intercepted previous to reaching them, because the support of this wire attached to the extreme end of the wood communicates by means of the pole with the earth.

These ground wires, however, are more injurious than beneficial, when they are not properly connected with the ground; that is to say, when there is any resistance interposing between earth and them. In order to obtain a proper communication with the ground, it is necessary to attach a heavy wire to the pole, and to roll it up spirally at the footing, taking care that it be not covered with tar.

When the poles are planted in the rock, or on the viaducts, use ought not to be made of these ground wires. But when it is deemed necessary to protect in similar case the wires, a non-insulated wire may be put up from one of the poles to the other, and connect to the ground at the nearest and most convenient spot.

When it begins to rain, after a long drought, it frequently happens that the mixture is more decided on the first day of moisture than on the following days. The soil being dry, and the ground wires being partially insulated, in consequence, they do not properly communicate with the earth until the soil becomes sufficiently moist.

When these wires are conducted to the top of the poles, and their extreme ends reach beyond the latter, they make good lightning-arresters.

The ground wires are also used in our climate to prevent the cross currents. They are used on every line. Every wooden support supplied by the depots are provided with wire to make the connection with the ground wire.

This system has been generally adopted, notwithstanding considerable opposition arising from an imperfect knowledge of the principle whereon it is based, and strengthened by the ill-success, in some cases, where the work had not been properly done.

4.—INSULATORS.

For lines of less than 100 miles length a plain bell insulator is used, and on the longer lines a double bell insulator is used.

The insulators are tested previous to their being delivered at the Supply Department. In a trough provided with lead is a rack, where the china bells fit; the bells are turned upside down, and the trough filled with acidulous water, to half an inch from the brim. The latter is slightly coated with grease, paraffine oil, or turpentine, to prevent the water from running over, and the cups are nearly filled with water.

250 cells of Daniells' battery, one pole of which is connected with the lead of the trough; the other pole is connected to an insulated manipulator; a very delicate galvanometer (very often a reflecting galvanometer) is connected in the circuit. The conducting wire is very rapidly, and in succession, plunged in the water which each insulator contains, and when one of them is defective the needle shows a deviation. After the test the insulators should be wiped off very carefully. Great care should be taken that the insulators to be tested are not covered with any grease.

In order to obtain the relative value of the different kinds of insulators, they are attached to

supports equally exposed from every side to the rain, and tested when the weather is uniformly moist.

The best method is as follows: On a pole should be attached a number of insulators, at least 10 specimens of each kind, connected by a wire which must represent the line. Another wire should be added to it, independent of the first, connected to the screw-nuts of the insulators to represent the communication with the ground, and to detect the passage of the current from one wire to the other.

In order that the test may give satisfactory results, it is proper to take the following precautions: Put up a pole at least 30 feet high in a free and unsheltered place; place the supports, whereon the insulators should be fixed, two feet apart, and the insulators a distance of one foot from the other, alternating and mingling the insulators as much as possible with those of another kind, so that all of them may be equally exposed.

Care should be taken to coil the wire, which represents the line, very closely and uniformly around each insulator, and to let it be of the same diameter throughout its whole length. This arrangement is made for the purpose of securing the uniform contact of the metallic surfaces with the porcelain, because the loss of current takes place on each part of the wire which covers the surface of the insulator, and, consequently, when the wire does not touch the surface of the bell uniformly, the loss of current will vary in proportion to the difference of the surfaces in contact. It is proper, when possible, to subdivide each series of 10 samples in half series of 5. If the test does not give the same results for each insulator of this half series, one of them probably will be defective, and ought to be removed in order to impair the test no more. The connection between each series and the testing room should not be made by means of special conductors insulated by a cover of gutta percha, as their surfaces would get more or less damp, and their insulation vary, even more than that of the insulators. It is proper to take but one wire, and to convey this by hand from one series to another.

It is very rare that rain continues to fall uniformly, so that, when the test lasts only five minutes, often a remarkable difference in the quantity of moisture during this interval will be noticed. After having examined each of the series, the test should be made over again in inverse order. If the result of this second test is conformable to the first, the experience is good.

As these tests serve less the purpose of ascertaining the *absolute* resistance of the different samples than to determine their *relative value*, it is better not to lose any time to count by units, but rather note the single deviations, so that the tests may be made rapidly, and that the circumstances under which they are made be as uniform as possible. Having used the greatest precautions, the tests are often very irregular.

Speaking generally, the best insulator is not the one that stands the test when it is new, but it is that which stands the action of the air and dampness best. Therefore the tests have no value at all unless they are continued for some months. Whatever provision be made, the result of the test is never entirely satisfactory; the only true method is to insulate two wires on the same pole a distance of ten miles or more, and to test them every moist day during six months.

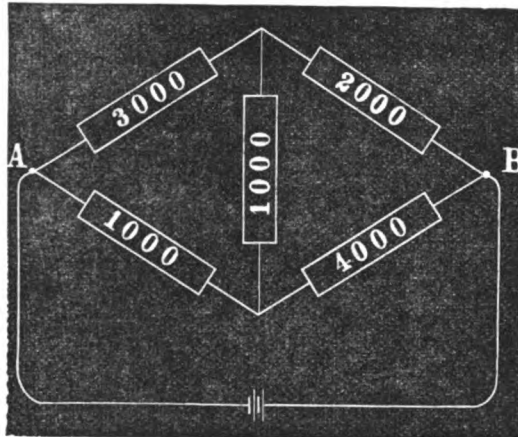
(To be Continued.)

NEWSPAPER ADVERTISING impels inquiry, and when the article offered is of good quality, and at a fair price, the natural result is increased sales.

CORRESPONDENCE.

To the Editor of the Journal of the Telegraph:

In the JOURNAL of Jan. 1st appeared a communication from me over the signature "X Y," containing a "problem" which I scarcely expected would attract much notice. It has recently, however, given rise to considerable discussion, and as, in its original form, it is so expressed as to be not always readily understood, I take the liberty of putting it in the shape of a bridge, thus:



Required the resistance between A and B.

N. Y., Oct. 8, 1874.

Yours, etc.,

A. S. BROWN.

To the Editor of the Journal of the Telegraph:

Can I bury an insulated wire or a cable of one thousand or two thousand feet long, one foot or more beneath the surface of the ground, and work a bell-magnet at each end with a Daniell battery?

Will induction interfere with the perfect working of such a cable as above mentioned. J. H. N.

You can work such a line in the manner indicated and without any appreciable effect from induction. The static charge upon an insulated wire of that length buried in the ground would be equivalent to that of an ordinary air line eighteen miles long.

DELHI, LA., Oct. 3d, 1874.

To the Editor of the Journal of the Telegraph:

Will you please answer through the JOURNAL, at your earliest convenience, the following interrogation, viz.: If an unknown party offers a message for transmission, requesting money to be sent to him in care of another party at another place, should I send the message when offered, or should the party offering it be identified before its transmission? V.

Answer.—The message should be sent. You have nothing to do with the identification of the party.

To the Editor of the Journal of the Telegraph:

I deliver my own messages and have a great deal of station work besides. Is it my duty to deliver a paid message to Mr. B's office, which is one-half mile—his residence one-fourth mile—from our office, or am I to deliver to nearest place? Please answer in next JOURNAL, and oblige, MANAGER.

Answer.—The message should be delivered at the place of business during business hours, afterward at the residence.

OSWEGO.—There are eleven words in "Yours received. Latch string hangs outside always. Bedroom ready. Bacon welcome." Bedroom one word; latch string two words.

AMATEUR, J. D. and Z.—Your solutions of X. Y's problem are incorrect.

IN MEMORIAM.

OMAHA, Oct 30, 1874.

To the Editor of the Journal of the Telegraph:

Many of your readers in the West will doubtless learn with sincere regret of the death of L. E. Warner, at Kansas City, of consumption, on the night of October 2d.

In him the Company have lost one of their most faithful and zealous workers, and the profession a conscientious and upright gentleman. He was a young man respected by all who knew him, as well for his quiet and unassuming manners, as his example of blameless manhood. I think all with whom he came in contact will bear cheerful tribute to his many good qualities of heart and mind, and that a genuine and keen regret will pervade the hearts of his many old associates at the knowledge of his early decease. His relatives and friends have the heartfelt sympathy of the fraternity of which he was an honored member. K.

THE NEW CODE OF RULES.

As, after a storm, there comes ever and anon lightshowers, like afterthoughts, dripping down upon the well-watered earth, so after the gush of correspondence respecting the new rules, there comes still, now and then, an omitted thought, which some interested correspondent desires to be remembered. Thus, from

Springfield, Illinois,

comes the following:

I suggest, for the base of a new rule, that offices be obliged to obtain addresses (definite) to all messages, or shall state a reason for failure, such as "address unknown," or "address known," etc.

From Denison, Texas.

In reference to new rules, please allow me to make the following suggestions:

Make a rule classifying the different kinds of messages passing over our wires, such as weather reports, Government messages, transfers, and others, showing their different rights over others and each other. This rule should be in italics, and printed on separate sheets, and posted in all operating rooms. I often notice considerable contention for circuit by offices where both hold either of the above important messages.

From Chicago, Illinois.

1. Insert two or three blank leaves at the end of each department or heading, so that when a new rule or a change of any rule is made and published in the JOURNAL, it can be cut out and pasted in the book on the blank leaf following the department or heading to which it appertains.

2. Don't number the rules consecutively throughout the book, but skip three or four numbers after each department or heading, so that any new rule could be given a number and pasted in the book on one of the blank leaves.

3. Why shouldn't we put on sent message blanks, "This message will be delivered free of charge for delivery within," etc., so that the customer may provide for or pay for delivery beyond that limit, if he chooses, instead of collecting from party addressed?

4. The meal rolls of repairers stationed at certain points sometimes cover meals for more than one person. In such cases the meal roll should bear a memorandum stating for whom the extra meals were had.

5. In order to keep on battery material, should not we have a special form of requisition for battery material, in order to show the number of cups of battery in use for which battery material is asked?

From Augusta, Ga.

I think the paragraph, "No operator shall be employed until he has borne a fair examination as an operator, penman, knowledge of circuits," etc., should be omitted, unless all operators now in the service of the Company be required to post themselves in regard to these matters. It is a lamentable fact that many first-class operators are ignorant on these points. Make it obligatory on their part to attain this knowledge in one year. In the meantime, let the JOURNAL publish, from month to month, such articles on the subjects as can be easily understood, accompanied by drawings, and if, at the expiration of the time named, there are any who cannot stand a fair examination, give them three months more, and if they are not then posted, supply their places with men who are, or REDUCE THEIR PAY a certain per centum until they come up to the standard. With intelligent men in offices it is easy to test a wire, and there is much time that can be saved which is now lost through their ignorance of all the subjects named.

NAMES OF STATES.

In the rule giving the abbreviated names of States as to be transmitted, Colorado, Nebraska, Nevada and Idaho should be required to be sent without abbreviation.

MESSAGE SIGNALS.

In transmitting cipher or "insured" messages, should not the word "cipher" or "insured" be first given?

From Chicago.

Whenever any office receives a message from another office stating that the party for which a certain message has been received cannot be found at the address given, comparison should at once be made with the address of original message, and if an error is found to have been made in transmission of original address, the delivery office should at once be informed of the correct address. If no error has occurred, the party sending the original message should be notified that the party addressed cannot be found at the place of address given.

THE EFFECT OF LIGHTNING ON TREES.—The theory that the splitting of the trunks of trees by lightning is the result of the sudden evaporation of the liquids contained within them has received much confirmation from experiments made by Osborn Reynolds, who succeeded in splitting small sticks of wood by passing the electric spark through them, after they had been impregnated with water. He also burst small glass tubes, which were filled with water, although the same tubes, when empty, allowed the electric spark to jump through them without in the least disturbing them. The most striking experiment made by him was upon a tube three-eighths of an inch exterior and one-eighth interior diameter, which could stand a pressure of at least 200 atmospheres to the square inch; this tube was 14 inches long and bent at a right angle. A very large electric flash being sent through the tube, it was split by the first discharge, and the pieces thrown to a distance of several feet. The inner surface of the tube was, in fact, completely pulverized, as though it had been struck by a hammer. Reynolds estimates that the pressure must have been more than 1,000 atmospheres.

It is now claimed that galvanism was discovered by a man named Swammerdamm one hundred and thirty years before Galvani called attention to it. The world, however, will not willingly change the name in order to give him the honor belonging to him. Swammerdammism! Awful!

THE TELEGRAPH TO IRELAND.

Telegraphic communication with Ireland is maintained by means of four submarine cables submerged between different points in Great Britain and the Irish Coast. These cables contain in all twenty-two separate wires, apportioned among the different routes as follows: Holyhead and Dublin, seven wires; Wexford, four wires; Belfast, seven wires; and Portpatrick and Donaghadee, four wires. These wires again are apportioned among the different towns in Ireland as follows: Dublin, nine; Belfast, eight; Cork, Waterford and Londonderry, each one; and Valentia, the landing place of the Anglo-American Company's cables, two. The towns in England and Scotland having direct communication with Ireland are London, Manchester, Liverpool, Newcastle, Glasgow and Stranraer. The system, it will thus be seen, is somewhat extensive and complicated, and the expense of maintaining it is necessarily heavy. One of the largest cables—that between Holyhead and Dublin—has been laid since the Post-office acquired the control of the telegraphs, and all of them have been under repair during the same period. That between Portpatrick and Donaghadee was repaired in December, 1872; the Belfast one very shortly afterwards, in February, 1873; and the ship had only returned to the Thames from repairing the Wexford route in July last when a "fault" developed itself in the Holyhead and Dublin line. The officials of the Post-office are at present engaged in the repair of this cable, for which purpose a considerable portion of the shore end on the Holyhead side has had to be taken in-board and overhauled. The rocky nature of the bottom along the Anglesea coast has, it appears, seriously affected the condition of this, the newest of all the Irish cables; and in many places the outer iron wires which form the chief protection of the core have been completely chafed through from constant friction. Quite a new feature has also developed itself in connection with this "fault," viz., the eating away by a kind of worm of the gutta percha covering of the core, in much the same way as wood is bored and eaten away by these destructive insects. The present stormy weather has interfered somewhat with the repair of this cable, and we understand that on Saturday last, when the ship went out with the view of submerging the repaired portion, a storm arose which compelled it to return into harbor, the cable meantime having become "kinked" in one or two places. The strong currents prevailing in the Irish Channel render it necessary that work of this kind should be completed on the flow of a single tide, and hence the difficulty which surrounds the present undertaking. The Post-office can hardly be congratulated on its possession of these lines to Ireland, as they have been a constant source of trouble and expense ever since the transfer of the telegraphic system to the Government. But it may very fairly be congratulated on the energy and promptitude with which it has undertaken the necessary works of repair in every instance, and the success which has generally attended its efforts to restore the means of communication at the earliest possible moment. Nothing short of this would satisfy the great public interests at stake, for it is to be borne in mind that not only the means of communication with Ireland itself, but those with America, are involved in any interruption which may occur. At present, as we have shown, two of the Post-office wires are devoted to the service of the Anglo-American Telegraph Company, and very shortly, we are informed, a third will be handed over to the Direct United States Company, whose cable is at present being laid. It may not be out of place to mention here that the in-

terruption to the Irish communication told somewhat seriously against the business which arose in connection with the recent meeting of the British Association at Belfast. The loss of seven wires out of a total of twenty-two was, of course, a very serious matter; and the difficulty which had to be faced by the Post-office was that instead of Dublin being able to give up some of its wires to Belfast, the latter had to relinquish no fewer than three of its ordinary wires in order to make good the usual cross-channel service. Notwithstanding this, however, we learn that no fewer than 405,000 words of press matter, being considerably more than 200 columns of the *Times*, were transmitted in connection with the meeting. The number of press messages in which this amount of matter was contained was close upon 900, while an almost equal number of private telegrams was created by the event. Necessarily some portion of the matter telegraphed was too late for publication next morning, for we learn that on the busiest night of the meeting nearly 80,000 words—equal to forty columns—had to be transmitted. Having regard, however, to the vastly diminished resources of the department, the work appears to have been singularly well done, and we can point to more than one occasion on which we were able to appear with from five to six columns of telegraphic matter. We noticed that the department followed its usual course on important occasions of this kind by opening an office for the receipt and transmission of telegrams in the Queen's College, where were the reception rooms of the Association, and we are glad to learn that the privilege was so largely taken advantage of that close upon 700 messages resulted from the arrangement.—*London Times*.

THE TELEGRAPH IN RUSSIA.

A letter from St. Petersburg states that the Russian Government, owing to the enormous increase in the number of telegrams, as the necessary consequence of the reduction in charges, has resolved to augment the present facilities for telegraphing by laying down the following auxiliary and branch lines:—From St. Petersburg to Tschudovo, from St. Petersburg to Novaga Ladoga, from Moscow to Orel, from Moscow to Wyasma, from Moscow to Kolomna, from Wilna to Minsk, from Nishni-Novgorod to Kasan, from Ssyfran to Samara, and from Sympheropol to Berdiansk. For the execution of these works, which are all to be completed in the course of next Summer, the capital required is estimated at 147,000 roubles, which are to be raised by legislative Act of the Council of State. At the same time the administration of the telegraphs asks for a credit of 86,000 roubles to purchase the materials for putting up the wires and posts next year on the line between Tomsk and Irkutsk, which must be completed and opened for public use in 1876.

We learn further from the same source that a request has been made by the British Ambassador at the Russian Court, as also by the Commander-in-Chief of the fleet and ports of the Black Sea, for an extension of the telegraph by a new land line from Nicolayef to Otschakof, and that the subject is under the consideration of the Administration. This new electro-magnetic line is intended to replace the present optical telegraph, which is found not to answer its purpose, its working powers being so frequently interrupted by the fogs prevalent in the Black Sea. The line acquires importance as being the means of reporting the state of the weather and the sea, the navigation of the River Bug, and for communicating instructions for vessels arriving for orders, and sending assistance to ships in distress. The English Government wish to see the line made in the interests of general commerce and navigation.

THE TELEGRAPH IN CHILI.—The Government now possesses 4,909 kilometres of telegraph wires. In 1873 there were transmitted 141,897 telegrams, containing 2,149,120 words, and the amount paid for transmission was \$58,295—an increase of \$11,714 over 1872.

INDO-EUROPEAN TELEGRAPH.—Owing to improved receipts for the half-year ending June 30, coupled with a certain amount of relief which the Board have obtained from the Indian Government and a reduction of the transit rates acceded to by the Imperial Russian Government, the Board are enabled to declare an interim dividend for the half-year ending the 30th of June last at the rate of 5 per cent. per annum, free of income tax. The Board are also gratified to be able to state that there is an early prospect of reduction in the present heavy payments made for the rent of the special wire to the British Post-office. The dividend will be payable on or after the 1st of October, and dividend warrants will be shortly forwarded to all shareholders not in possession of coupons payable to bearer.

The Directors of the Eastern Telegraph Company announce the payment, on the 14th of October, of the usual interim dividend of 2s. 6d. per share, free of income tax, for the quarter ending June 30, 1874.

At a meeting of the Board of Directors of the Anglo-American Telegraph Company it was resolved to pay the usual interim dividend of 1½ per cent. for the quarter ending September 30, 1874.

The total number of messages forwarded from postal telegraph stations in the United Kingdom during the week ending September 19th, 1874, was 415,816—an increase of 57,509 on the corresponding week of last year.

CONSTANTS OF NATURE.

The following circular has been issued by the Smithsonian Institution, asking the aid of chemists and physicists throughout the country in the preparation of a series of tables, the value of which, when completed, will be incalculable. No more important contribution to the sum of knowledge and to the advancement of science, both practical and theoretical, can well be imagined than the determination of some of these constants:

SMITHSONIAN INSTITUTION,
WASHINGTON, D. C. }

The Smithsonian Institution has in view the publication of a series of tables of "Constants of Nature," such as the atomic weight of bodies, specific gravity, expansion, elasticity, specific and latent heat, conducting power, melting and boiling point, weight of different gases, liquids, and solids, crystalline form, strength of different materials, index of refraction and dispersion, polarizing angle, velocity of sound, of projectiles, of winds, of electricity, of light, of flight of birds, speed of animals, etc., etc.

The value of such a work in aiding original investigation, as well as in the application of science to the useful arts, can scarcely be overestimated. To carry out the idea fully, however, will require much labor and the united efforts of different institutions, and individuals devoted to special lines of research.

The co-operation, therefore, of those who receive this circular is respectfully invited to this enterprise.

Since the different constants are to be carefully tabulated, even a single determination of any one constant for any one body may prove to be of great value by supplying some important omission in a series.

Every contributor will, of course, be credited with his determinations, when published.

JOSEPH HENRY,
Secretary Smithsonian Institution.

TARIFF BUREAU.

SEMI-MONTHLY CIRCULAR.

EXECUTIVE OFFICE,
WESTERN UNION TELEGRAPH COMPANY,
145 Broadway, New York, October 15, 1874.

To all offices on W. U. Lines:

The following changes and additions have been made since the date of the last circular:

GENERAL INFORMATION.

Kingston, Cal., is now an other line office, "tariff for other lines" 30 +10 from Colusa.

Manitou House, Colorado Springs, Col., closed temporarily; messages, until further notice, will be sent to Colorado Springs.

Hereafter half-rate messages will not be taken for, or received from, Bluff Springs, Milton, Molino and Navy Yard, near Pensacola, Fla.

Stockwell, Ind., closed.

North Forktown, Ind. Terr., changed to Eufaula.

Telegraph communication between Matamoras and Reynosa, in Mexico, has been restored.

Carlton, Mich., is now a W. U. office, square 311; Check direct.

Traverse City, Mich., is now a W. U. office, square 118; Check direct.

Como, Miss., closed.

DeKalb, Mo., closed.

Pappilhon, Neb., is now a W. U. office, square 464; check direct.

The following Summer offices in New York have been closed for the season:

Crystal Springs.

Five Mile Point, Otsego Lake.

Trenton Falls.

Watkins' Glen.

Overlook Mountain House.

Scipio, N. Y., Re-opened.

Sharon Station, N. Y., closed.

Round Lake, N. Y., closed.

Hereafter the charge for delivery of messages from Sparkill, N. Y., to Tappan town will be seventy-five cents, instead of one dollar, as heretofore.

Minnequa Springs, Pa., closed.

Preston, Pa., changed to Fossilville.

Sheakley, Pa., closed.

Edgar, Tenn., closed.

Eagle Lake, Texas, Re-opened.

The following Summer offices in Virginia have been closed for the season:

Blue Ridge Springs.

Montgomery White Sulphur Springs.

Rowley Springs.

Jackson River, Va., closed.

Dimmock, W. Va., closed.

Meadow Creek, W. Va., closed.

NEW OFFICES.

Gaviota, Cal.

* Middletown, Cal., 60 +10 from Colusa.

Napa Junction, Cal.

White's Hill, Cal.

32 Tariffville, Conn.

267 Grantville, Ga.

309 Claremont, Ill.

468 Eufaula, Ind. Terr. (formerly North Forktown.)

435 Paton, Iowa.

263 Shepherdsville, Ky.

375 Jefferson, La.

456 Wallace, Mo.

516 Edgar, Neb.

65 Central Valley Junc., N. Y.

* Constable, N. Y., 25 1 33 Montreal Junc., Que., Mont. Co.

* Westville Centre, N. Y., 25 1 " " "

* West Constable, N. Y., 25 1 " " "

501 Shiloh, O.

* Bishop's Mills, Ont.

* Carthage, Ont. "

* Demorestville, " "

* Northport, " "

* North Augusta, " "

* Oakville Sta., " "

* Oxford Mills, " "

123 Fossilville, Pa. (formerly Preston.)

140 Martinsburg, Butler Co.; check Petrolia City.

* St. Marie de la Beauce, Que.

* Trout River, Que.

* Vandrenil Village, Que.

* Williamson's, Va., 40 3 96 Richmond.

† For each additional 5 words or less.

The notice of the opening of Carlton, Mich., office, in last JOURNAL, should be disregarded.

ATLANTIC CABLE BUSINESS.

Messages may now be addressed *direct* to parties in Buenos Ayres. The rate from France is \$60.22 for twenty words or less, and half that amount for each additional ten or fraction of ten words.

Messages for Chili, upon which the new rate to Buenos Ayres should be collected, will hereafter be addressed "Oldham," Buenos Ayres.

Code or cipher messages may now be accepted for Turkey. The Shanghai and Amoy cable is broken. Messages for Amoy are posted at Singapore or Shanghai.

WILLIAM ORTON, *President*.

TRANSFER SERVICE.

EXECUTIVE OFFICE,
NEW YORK, September 21, 1874.

To all Transfer Agents and Offices:

Payments to customers by Agents or Managers on account of transfers over thirty days old are hereby prohibited.

All applications for such payments, whether the same be for a refund of the principal of a cancelled transfer, or the charges thereon, or the balance of a transfer partially paid, must be referred to this office for examination and approval, after which any payment will be made by check from the Treasurer.

This order applies to all sums of money held on transfer account where thirty days have elapsed since the date of the original deposit of funds with this Company by the customer.

GEO. H. MUMFORD, *Vice-Pres't*.

EXECUTIVE OFFICE,
NEW YORK, Oct. 12, 1874.

On and after November 2, Harrisburg, Pa., will be added to the list of offices *specialty authorized*.

On and after October 26th, Pensacola, Fla., will be added to the list of money order offices in J. A. Brenner's District.

Fort Laramie, Wy., in W. B. Hibbard's District, has been reopened as a money order office.

Grand Island, Neb., has been discontinued as a money order office. GEO. H. MUMFORD, *Vice-President*.

THE TELEGRAPHERS' MUTUAL BENEFIT ASSOCIATION.

ASSESSMENT 69, ISSUED OCT. 14, 1874.

DEATH OF VINCENT A. SHEA.

VINCENT A. SHEA, (Certificate No. 1418, issued February 16, 1872,) died at Troy, N. Y., Oct. 7th, 1874, of hemorrhage of the lungs.

One dollar is due on above assessment from members whose certificates are dated previous to Sept. 1st, 1874.

ACKNOWLEDGMENT OF RECEIPTS FOR ASSESSMENTS UP TO AND INCLUDING OCT. 10, 1874.

ASSESSMENT NO. 68.

6, 8, 51, 55, 56, 59, 61, 67, 72, 80, 83, 89, 90, 108, 114, 121, 129, 133, 134, 141, 142, 144, 153, 175, 176, 177, 201, 202, 220, 223, 230, 235, 244, 254, 267, 267, 274, 276, 278, 279, 281, 282, 283, 285, 286, 344, 351, 367, 380, 391, 392, 393, 394, 406, 412, 414, 416, 425, 430, 431, 434, 463, 516, 530, 535, 538, 548, 549, 576, 577, 587, 600, 603, 622, 649, 662, 663, 664, 665, 669, 672, 673, 680, 703, 750, 751, 756, 787, 791, 799, 830, 831, 855, 874, 876, 901, 934, 977, 995, 1011, 1023, 1034, 1040, 1055, 1061, 1065, 1167, 1173, 1195, 1196, 1200, 1225, 1245, 1252, 1260, 1266, 1273, 1276, 1294, 1299, 1335, 1359, 1364, 1365, 1366, 1365, 1369, 1390, 1391, 1394, 1395, 1412, 1440, 1444, 1453, 1452, 1516, 1518, 1550, 1560, 1592, 1601, 1607, 1608, 1615, 1625, 1630, 1634, 1635, 1656, 1658, 1662, 1666, 1707, 1721, 1728, 1729, 1790, 1791, 1800, 1810, 1811, 1812, 1815, 1817, 1818, 1831, 1835, 1847, 1869, 1874, 1881, 1907, 1911, 1913, 1914, 1915,

1934, 1938, 1939, 1999, 2000, 2001, 2034, 2038, 2039, 2036, 2038, 2040, 2044, 2048, 2057, 2068, 2119, 2137, 2160, 2162, 2172, 2194, 2195, 2196, 2202, 2203, 2204, 2205, 2206, 2208, 2212, 2214, 2216, 2223, 2224, 2228, 2241, 2242, 2243, 2276, 2278, 2280, 2284, 2285, 2296, 2297, 2298.

ASSESSMENT NO. 66.

8, 51, 55, 185, 186, 187, 238, 438, 481, 537, 652, 665, 697, 705, 725, 799, 869, 899, 903, 915, 920, 934, 977, 1071, 1085, 1103, 1225, 1273, 1289, 1400, 1504, 1516, 1556, 1557, 1559, 1570, 1600, 1601, 1607, 1608, 1610, 1611, 1612, 1613, 1653, 1670, 1673, 1690, 1691, 1692, 1741, 1835, 1934, 1945, 1946, 1947, 1968, 1974, 1987, 1995, 2038, 2151, 2160, 2194,

MISCELLANEOUS.

No. 67.—33, 78, 952, 1144, 1267, 1970, 2262.

No. 65.—19, 1182, 1605, 1657, 1978.

No. 63.—300, 1650.

Members of the Association who look to the JOURNAL OF THE TELEGRAPH for receipt of assessments paid, will please take notice, that an acknowledgement of the receipt of one assessment should be taken as a receipt for all previous assessments.

A MEETING of the members of the Chicago district of the Telegraphers' Mutual Benefit Association was held in that city, Oct. 4th, at which Mr. W. C. Long was appointed Chairman, and Mr. E. Lomasney Secretary. The object of the meeting was to elect a delegate to represent the district at the annual meeting of the Association in New York on Nov. 11th, and to express the sense of the district upon certain clauses of the Constitution which it was believed operated injuriously to the general welfare.

Mr F. W. Jones was unanimously elected delegate, and a resolution adopted that the expenses of the delegate to the annual meeting be paid by the district.

The following resolutions for the guidance of the delegate were unanimously adopted:

Resolved, That our delegate to the Annual Convention, to be held in the City of New York eleventh of November next, be and is hereby authorized to work for an amendment to that article of the Constitution which debar delinquent members from being reinstated without paying up all back dues, etc., etc., as follows:

That delinquent members desiring to be reinstated who are in arrears over sixty days and under one year, shall be required to file an application for restoration to membership, and pay up all back dues; but after this time, in consideration of delinquent members incurring such great risks as they do by allowing themselves to become delinquent (it not being our province to inquire into the cause therefor) for one year or over, and who desire to be restored to membership, shall only be required to file the same application, furnish the same certificate and pay the same fees as new members; not being required to pay up all back dues as heretofore.

Resolved, That it is our belief that many members who have become delinquent more than one year, who are in good standing and desirable, would again join our ranks did they fully understand the terms and conditions of the above resolution. That we suggest all such delinquent names be selected from the books of the Association of New York, and a copy of these resolutions, if adopted by the Annual Meeting on the 11th of November next, be sent them for their consideration, believing that the interests of this Association will be advanced thereby.

BORN.

JONES.—At Catlettsburg, Ky., Sept. 19, 1874, to Charles W. Jones, Manager W. U. Tel. Office, a son.

MONTGOMERY.—At Brownsville, Texas, Sept. 14, 1874, to C. W. Montgomery, Manager W. U. Tel. Office, a daughter.

SHAVER.—At Auburn, Ind., Sept. 28, 1874, to E. S. Shaver Manager W. U. Tel. Office, a son.

SMITH.—At Union, N. Y., Oct. 4, 1874, to Will. G. Smith, Telegrapher, a son.

MARRIED.

HUDNUTT—DEMING.—At the Episcopal Church, South Bend, Ind., by Rev. W. Richmond, Calvin G. Hudnutt, formerly of Geneseo, N. Y., to Miss Lois Deming of South Bend.

DIED.

SHEA.—At Troy, N. Y., Oct. 7, 1874, Vincent A. Shea.

THE PROPOSED ELECTRICAL SOCIETY.

A meeting of electricians and practical telegraphers was held at Chicago, September 14th, for the purpose of taking preliminary measures towards the organization of a national association for the advancement of electrical science. At this meeting it was decided to form such an association under the name of The American Electrical Society, and a committee was appointed to draft a suitable constitution and by-laws for the government of the proposed society, and to invite all who may in any manner be interested in the objects of such an association to attend a meeting in that city on Wednesday, 21st inst., for the purpose of effecting a permanent organization.

The time has arrived when such an association has become a necessity, and we hope and believe that the movement will result in success. There are many electricians in this country, who, in point of ability, are second to none elsewhere, and as practical telegraphers the operators of America are peerless. The meetings of such a class, their discussions, recommendations and conclusions, cannot fail to exercise a great influence upon the future of the electric telegraph.

The project, so far as developed, is meeting with the warmest approval in all branches of the telegraphic art, and will not fail for want of hearty co-operation.

THE BLOCK SYSTEM OF RAILWAY SIGNALS.

Professor Thomson states that the latest development and application of the block system is one which has been made in Scotland, on the Caledonian Railway. It consists mainly in arranging that, along a line of railway, the semaphore arms are to be regularly and ordinarily kept up in the horizontal position for prohibiting the passage of any train, and that each is only to be put down when an approaching train is, by any electric signal from the cabin behind, announced to the man in charge of that semaphore as having entered on the block section behind, and when, further, that man has, by an electric signal sent forward to the next cabin in advance, inquired whether the section in advance of his own cabin is clear, and has received in return an electric signal meaning: "The line clear; you may put down your debarring signal, and let the train pass your cabin." The main effect of this is that, along a line of railway, the signals are to be regularly and ordinarily standing up in the debarring position against allowing any train to pass; but that just as each train approaches, and usually before it has come in sight, they go down almost as if by magic, and so open the way in front of the train, if the line is ascertained to be duly safe in front; and that, immediately on the passage of the train, they go up again, and by remaining up keep the road closed against any engine or train whose approach has not been duly announced in advance, so as to be at the first and second cabins in front of it, and kept closed, unless the entire block section between those two cabins is known to have been left clear by the last preceding engine or train having quitted it, and is sufficiently presumed not to have met with any other obstruction by shunting of carriages or wagons, or by accident, or in any other way.

UNSUCCESSFUL TERMINATION OF THE DIRECT CABLE EXPEDITION.

On Thursday, Oct. 5th, the steamers Dacia and Ambassador, the consorts of the cable steamer Faraday, engaged in the work of laying the long section of the direct cable between Ireland and Newfoundland, arrived at Queenstown, Ireland, bringing news of the failure of the attempt to lay the cable. They report that the cable was lost in a heavy gale, after some 600 knots had been laid.

They were engaged with the Faraday several days in attempts to recover the cable, but without success, and were compelled to return to Queenstown, because short of coals and provisions. On Friday morning the Faraday, which followed the Dacia and Ambassador, also arrived at Queenstown.

It is reported that the Faraday will put to sea as soon as she has taken in provisions and coal, and will resume the attempt to recover the cable. Should her efforts be successful she will proceed to lay the remainder of the cable to the American coast.

A circular has been sent to the shareholders of the Direct Cable Company informing them that the management has decided to abandon about thirty miles of the cable, which is now lying on a rocky bottom, and effect a splice at a more suitable point. The circular says that in all about 1,100 miles of cable have laid, and satisfactory tests are obtained daily by the electricians.

SCIENTIFIC PRIZES.

The Dutch Society of Science, which held its 122d general meeting at Haarlem on the 16th of May, offered prizes for the following questions, all papers to be handed in by Jan. 1st, 1878:

1. Exact researches on the solvent power of water, and of water charged with carbonic acid, upon gypsum, limestone and dolomite, at different pressures and temperatures, and in case of the simultaneous presence of common salt, and of other salts extensively distributed in nature.
2. Similar researches on the solvent power of water, and water charged with carbonic acid, upon silica, and the common natural silicates, under the same circumstances.
3. New researches on the structure of the kidneys of mammiferous animals.
4. It appears to result from recent researches that the peptones of the different albuminoid matters are mixtures of substances partly known and unknown. Required, a critical examination of these researches, supplemented by personal investigations on the same question.
5. Exact determination, in Weber's unities, of the resistance of a column of mercury of a meter in height, and of a square millimeter in section.
6. Improved experimental determination of the relations between the two kinds of experimental unities, the electro-magnetic and electro-static.
7. New experiments on the influence of pressure upon chemical action.

NEW APPLICATION OF ELECTRICITY ON RAILROADS.

The French have lately introduced a system by which a stationary electric battery is made subservient to blow the whistle of an approaching locomotive, in case the road is not clear, without the engineer having to give any attention to it. Such an arrangement is of course exceedingly valuable at night, and especially during a fog, when signals cannot be seen at a distance. It is the reverse of the system introduced on our Hudson River Railroad, by which every approaching locomotive sets a stationary

electro-magnetic alarm bell at the depot in motion. In the French system referred to the obstruction at the depot starts the steam whistle on every approaching locomotive when the train is still far enough away to slacken speed and stop. It has now been in successful operation for a year on the line of the Northern Company of France, informing the engineer whether the way is clear or not. The signal tender turns a disk and sends an electric current in the direction of the coming train to a bar placed between the rails. When the engine reaches the spot, a metal brush, placed between the wheels, sweeps the bar, the current passes to the engine, and, by means of an electro-magnet, presses upon a lever which opens the steam whistle, thus making it blow automatically.

THE PATENT OFFICE.

The recent appointments or promotions in the Patent Office, consequent upon the resignation of Commissioner Leggett, give unusually good satisfaction to the agents and attorneys practising before the bureau. There has been a lively contest for the position of Examiner of Interferences, made vacant by the promotion of M. S. Hopkins to the Examiner-in-Chief, and it has been decided to allow the contest to be settled by a competitive examination under the Civil Service rules.

Since the 1st of July last there have been 2,849 patents for inventions issued by the U. S. Patent Office, against 3,061 for the same period last year, and 3,289 for the year preceding. The whole number of patents issued for the year 1872 were 12,200, and in 1873, 11,616; for the nine months of the present year, 9,488, which shows a slight gain on the monthly average of the two preceding years.

The General Index of Patents from 1790 to 1873, inclusive, has been for some time in preparation, and the subject matter portion, which is a classified list of inventions for 84 years, is now in press and will soon be ready for delivery. It will consist of about 1,800 pages. The edition is limited to 1,000 copies, bound in three volumes. It will be sold by the Patent Office for \$20, which, the official notice says, will not cover the cost of publication.

PRESENTATIONS.

MR. GERRITT SMITH.

On Saturday evening, Oct. 10th, Mr. Gerritt Smith, assistant to the Electrician of the Western Union Telegraph Company, was the unexpected recipient of a handsome gold watch from the staff of the operating department at 145 Broadway, with whom he was formerly connected as chief operator.

MRS. NETTIE PARKER.

A NUMBER of merchants of Halifax, Yarmouth, and other places in Nova Scotia, recently presented Mrs. Nettie Parker with a gold bracelet and a highly complimentary letter, upon the occasion of her resignation as Manager of the Yarmouth, N. S., office of the Western Union Telegraph Company.

MR. EDWARD H. RICH.

MR. EDWARD H. RICH, having resigned his position as Superintendent of Telegraph and Train Dispatcher on the Southern Central Railroad, his friends on the road presented him with a valuable clock and a handsome silver water pitcher and goblets. The Board of Directors also passed resolutions very complimentary to Mr. Rich's ability and faithful performance of duty.

Journal of the Telegraph.

This Journal is issued on the 1st and 15th of each month. Its circulation is over 8,000. It goes to every State, Territory and Province on the Continent. It has become a necessity, and is always welcomed as a friend. No better medium for advertising exists.

TERMS:

TWO DOLLARS PER ANNUM IN ADVANCE.

Address—

JOURNAL OF THE TELEGRAPH,

Western Union Telegraph Company,
145 Broadway, New York.

NEW YORK, OCTOBER 15, 1874.

WESTERN UNION TELEGRAPH COMPANY.

ELECTION OF DIRECTORS.

At the Annual Meeting of the Stockholders of the Western Union Telegraph Company, held at the office of the Company, No. 145 Broadway, New York, October 14th, 1874, the following gentlemen were elected Directors and Inspectors of Election for the ensuing year:

Directors.

WILLIAM ORTON,	C. LIVINGSTON,
JAMES H. BANKER,	JAMES MILLIKEN,
ALONZO B. CORNELL,	LEVI P. MORTON,
HARRISON DURKEE,	GEORGE H. MUMFORD,
NORVIN GREEN,	O. H. PALMER,
JOSEPH HARKER,	GEORGE M. PULLMAN,
EDWIN D. MORGAN,	E. S. SANFORD,
AUGUSTUS SCHELL,	JOHN STEWARD,
W. K. THORN,	MOSES TAYLOR,
C. VANDERBILT,	DANIEL TORRANCE,
FRANK WORK,	W. H. VANDERBILT,
CHESTER W. CHAPIN,	W. R. VERMILYE,
WILSON G. HUNT,	E. B. WESLEY,
DAVID JONES,	STILLMAN WITT,

E. D. WORCESTER.

Inspectors of Election.

GEORGE B. PRESCOTT, LEONARD COX,
WM. ARNOUX.

At a meeting of the Board of Directors, held at the Executive Office Thursday, October 15th, the following officers were elected:

WILLIAM ORTON, *President*.

A. B. CORNELL,	} <i>Vice-Presidents.</i>
AUGUSTUS SCHELL,	
GEORGE H. MUMFORD,	
NORVIN GREEN,	
HARRISON DURKEE,	

Executive Committee.

WILLIAM ORTON,	JOSEPH HARKER,
JAMES H. BANKER,	EDWIN D. MORGAN,
ALONZO B. CORNELL,	AUGUSTUS SCHELL,
HARRISON DURKEE,	W. K. THORN,
NORVIN GREEN,	C. VANDERBILT,
FRANK WORK.	

"WHAT good will my testing do if I cannot explain the result?" asks the wordy and irrepressible Bear, who then "rises to explain" that "two like currents pass each other on same line in opposite directions!"

THE QUADRUPLIX.

We briefly mentioned the fact in our last issue that the Quadruplex was in successful operation between New York and Boston. Since then this invention has been constantly and uninterruptedly working between these two cities, and regularly and fairly doing the work of four wires on one. The apparatus is now being made for extending its use upon longer circuits and we hope soon to be able to announce the fact that it is working satisfactorily between New York and Chicago. The value of such an invention can at first scarcely be realized. It is really worth more to the Company than the wires which it replaces, or rather represents, for upon these imaginary wires there are no charges for interest, taxes or maintenance—the latter item alone costing \$8 per annum for each mile of wire in operation. Between New York and Chicago alone, the use of the Quadruplex upon one wire would give extra facilities which, if the Company had to erect additional wires to secure would cost over \$25,000 per annum simply for repairs, to say nothing of the interest on the investment, the taxes on the additional property, and the annual deterioration of the plant.

Fortunately for the success of this new invention the Company has the best lines to work it upon, and the best operators to work it with, to be found anywhere in the world. The marvellous success which attended the introduction upon our lines of the great invention of Stearns could not have been secured anywhere else. It was the splendid condition of the Western Union lines, their incomparable insulation, and the unequalled expertness of the operators which made this invention a practical success from the start, and the same conditions will be equally available for the successful introduction upon all of our principal circuits of the new discovery in multiple telegraphy.

SIGNAL SERVICE MESSAGES.

Complaints are still made that messages offered for transmission by observers and others connected with the Signal Service of the Army are refused by some of our offices because they are not prepaid. All such messages should be entered as paid at the offices where they originate, and be sent as paid over the line, but prepayment should not be exacted of the observers or other officers who offer them for transmission. An account of such messages should be kept and forwarded monthly to the Auditor, together with the original messages, and credit taken therefor as cash. Observers or other officers sometimes mark their messages collect, but this should make no change in the disposal of them. They are always to be sent paid, and if not paid by the sender, they are to be forwarded to the Auditor for payment.

THE Annual Meeting of the Telegraphers' Mutual Benefit Association will be held at 145 Broadway, New York, at 7½ P. M., Wednesday, November 11th. There should be a large delegation of intelligent men at that meeting. Let the best men come, and let there be plenty of them.

ANNUAL REPORT OF THE PRESIDENT OF THE WESTERN UNION TELEGRAPH COMPANY TO THE STOCKHOLDERS.

To the Stockholders of the Western Union Telegraph Company:

In pursuance of a requirement of the By-Laws of the Company, and of instructions of the Executive Committee, I submit the following Report of the operations of the Company for the fiscal year ended June 30, 1874:

The capital stock of the Company is \$41,078,410, of which the Company owns, and now has in its treasury, \$7,287,735, leaving the capital outstanding \$33,785,675.

The bonded debt is \$5,946,910. Of this sum \$4,448,900 is in seven per cent. currency bonds, which will mature November 1, 1875; and \$1,498,000 in seven per cent. gold bonds, due in 1902. The bonded debt was reduced during the year by the redemption of bonds of the American Telegraph Co., which matured October 1, 1873, amounting to \$89,500, and by the purchase for the Sinking Fund of \$2,000 of the bonds of 1902.

The Company has no floating debt.

The receipts for the year from all sources were \$9,262,653.98, and the expenses \$6,755,733.83. The difference \$2,506,920.15 is the net profit.

There have been added to the property of the Company during the year, by construction, purchase and lease, 5,828 miles of poles, and 21,264 miles of wire, being equal to about 8 per cent. of line and 12 per cent. of wire; and 448 more offices were in operation at the close of the year than at the beginning. The Company operated at the close of the year, 71,585 miles of line, 175,135 miles of wire, and 6,188 offices.

The \$2,506,920.15 profits of the year have been applied as follows:

Interest on Bonds.....	\$315,138 83
Construction of new lines and erection of additional wires.....	511,849 53
Purchase of the stock of sundry telegraph companies in the Western Union system on which rent is paid annually.....	96,233 00
Patents.....	3,000 00
American Telegraph Co.'s Bonds redeemed Oct. 1, 1873.....	89,500 00
Sinking Fund for redemption of Building Bonds of 1902.....	30,000 00
Real estate (of which \$281,234.81 was expended on the building, Broadway and Dey street, in excess of the loan of \$1,500,000).....	291,603 33
Dividend of two per cent. payable July 15, 1874..	675,574 00
	\$2,012,946 68

The balance..... \$493,973 47 has been carried to the credit of Income Account, and is included in the following exhibit of the application of the Company's

PROFITS FOR EIGHT YEARS.

The surplus of Income Account, July 1, 1866, was	\$375,357 24
The net profits for eight years, from July 1, 1866, to June 30, 1874, were.....	22,839,533 96
Making an aggregate, June 30, 1874, of.....	\$23,104,896 20

Of this sum there has been—

Distributed in dividends to stockholders (including dividend payable July 15th).....	5,532,813 34
Disbursed for interest on the Company's bonds...	2,531,333 81
	\$8,064,147 15
The balance.....	\$15,040,749 05

is represented as follows:

Construction of new lines, erection of additional wires, purchase of patents, &c.....	4,991,458 15
Purchase of telegraph lines and of the stock of	

companies controlled by the Western Union Company on which interest or dividends are paid as rental.....	1,301,985 45
Western Union stock (72,877 shares).....	4,054,488 07
Gold and Stock Telegraph Co. stock (47,710 shares).....	1,173,509 00
International Ocean Telegraph Company's stock (10,384 shares).....	961,556 48
Anglo-American Telegraph Company's stock (£1,306).....	10,000 00
Central District and Printing Telegraph Companies' stock (Pittsburgh,) 300 shares.....	10,000 00
Western Electric Manufacturing Company's stock (500 shares).....	89,000 00
Western Union Bonds—redeemed and cancelled... Sinking Fund—Broadway and Dey Street Mortgage Bonds (amount not yet used for redemption of bonds).....	1,073,345 00
Real Estate (other than Broadway and Dey Street property).....	57,800 00
Broadway and Dey Street property, (in excess of the loan of \$1,500,000).....	388,680 66
	281,234 81
Total.....	\$14,282,197 56
Leaving a surplus of.....	\$758,551 49
represented as follows:	
Material and supplies on hand.....	\$440,051 49
Due from United States.....	70,000 00
Due from Agents.....	75,000 00
Cash on hand and loaned on call, in excess of amount required for dividend July 15th, and for current liabilities.....	178,500 00
	\$758,551 49

PACIFIC AND ATLANTIC TELEGRAPH COMPANY.

In my last Annual Report it was stated that we had acquired a majority of the stock of the Pacific and Atlantic Telegraph Company, and that negotiations were then pending for a lease of its lines to the Western Union Company. The negotiations were concluded in December last, and on the first of January the lines and property of that Company were turned over to us on a lease for 99 years, at an annual rental equal to 4 per cent. on the capital stock of \$2,000,000, the rent to be applied first to the payment of the debts of the P. and A. Co., and thereafter to be distributed *pro rata* among the shareholders. Of the capital of \$2,000,000 the Western Union Company owns \$1,415,950. The entire rental for the year 1874 will be required to pay the debts of the P. & A. Co. It is probable, however, that thereafter the rental can be distributed among the stockholders.

THE INTERNATIONAL OCEAN TELEGRAPH COMPANY.

The operations of this Company during the past year have been very satisfactory, and give promise of still better results in future. As I write, however, communication by cable between Punta Rassa and Key West is interrupted, but the necessary steps have already been taken to repair the cable, and it is expected this will be accomplished in a short time. The new cable between Key West and Havana, successfully laid the year before, has been paid for, and the entire floating debt of the Company discharged out of last year's earnings. There are now two good cables between those points. Unless it shall be found necessary, in order to insure permanent communication between the United States and the West Indies and South America, to lay an additional cable between Punta Rassa and Key West, it is probable that payment of dividends to the Stockholders of the I. O. T. Company will be resumed within a year. This property is destined to increase largely in value in the near future.

The receipts of the I. O. T. Co., for the year ended June 30, 1874, were.....	308,870 99
Expenses.....	71,561 13
Balance, net profit.....	237,309 86
Add proceeds of \$30,000 bonds issued.....	73,000 00
	308,309 86

This has been appropriated as follows:

Paid India Rubber, Gutta Percha, and Telegraph Works Co., balance due for new cables.....	\$94,640 87
For expenditures on S. S. "Professor Morse".....	71,538 26
For loans repaid.....	49,500 00
" bonds redeemed.....	25,800 00
" reconstruction of cables.....	22 770 13
" interest on debt.....	20,418 40
" construction.....	2,836 64—287,499 26
Balance, merged in general assets.....	\$21,810 56

THE GOLD AND STOCK TELEGRAPH COMPANY.

Of the \$2,500,000 capital of this Company, the Western Union Company owns \$1,192,750. Its gross receipts for the fiscal year ended September 18, 1874, were \$581,000, and the operating expenses \$419,000, leaving \$162,000 as the net profit, all of which was expended in the extension of its lines and the provision of new apparatus, of which a large quantity was required in view of the extremely low rate fixed for the rental of Stock Reporting instruments to meet the competition of the Manhattan Quotation Company. The Gold and Stock Company has expended out of its net earnings during the last four years over \$700,000 for new lines, machinery and apparatus.

MONEY TRANSFER SERVICE.

The operations of the Department of Telegraphic Money Orders, which has been established less than three years, are highly satisfactory. During the last year it transferred—that is, received at one office and paid out at another—about \$2,000,000, for which service the Company received a revenue of \$80,329.86. Of this sum about \$20,000 was for premiums, and the balance for tolls on the messages required in making the transfers. The revenue from this source during the preceding year was about \$57,000, and the increase during the past year has been about 40 per cent. The increase in the number of transfers, however, was about 60 per cent., attended by a reduction of the average amount transferred in each case from \$81.31 the preceding year to \$61.88 during the past year. This reduction and increase indicates the growing popularity of the service. The receipt in small sums, at a large number of offices, of an aggregate of \$2,000,000, and the payment of this amount at other offices, involving the handling of \$4,000,000, has been attended by an aggregate loss to the Company during the year, from errors and defalcations, of only \$110. During the same time a larger sum has accumulated in the treasury of the Company from cases where it was impossible to find either the transferee or the person making the deposit for transfer. This branch of the service is under the immediate charge of Vice-President Mumford, who prepared the rules and regulations for the conduct of the business. In view of the success which has attended their operation, this specific acknowledgment seems to be due to him.

THE NEW BUILDING.

At the close of the fiscal year, June 30, 1874, the account with the new building presented the following exhibit:

Paid on account of real estate.....	\$865,000 00
Paid to architects and contractors.....	683,511 25
Paid engraving, printing, commission on sale and other expenses of negotiating the bonds.....	17,190 81
Taxes.....	21,389 56
Interest on bonds.....	204,163 19
	\$1,781,234 81

Of this sum \$1,500,000 is represented by the bonds of the Company due in 1902, and the balance, \$281,234.81, has been paid out of current earnings. To the latter may now be added the further sum of \$153,080.98, paid during the quarter ended September

30th, making a total of \$434,315.79, for which the Building Account is indebted to Income Account.

The work on the building was greatly delayed during last Fall and Winter by the failure of the contractors to supply the granite at the rate agreed upon, and later, by delay in the delivery of other materials. The work is now progressing rapidly, and it is expected the portion to be occupied by the Company will be ready by Christmas.

GENERAL REVIEW.

A comparison of the results of the Company's operations during the last fiscal year, and the one preceding, shows a reduction of \$70,364.53 in gross receipts, and of \$251,042.54 in the net profits.

This diminution of receipts and profits resulted from two causes; *first*, the reduction of rates, which took effect on July 1, 1873, pursuant to plans formed and instructions issued six months before; and *second*, to the financial panic of September, 1873, and the general stagnation in every department of business which immediately followed, and from which there has been but a partial recovery.

Commencing with July, 1873, the profits, as compared with the corresponding months of the preceding year, were less each month up to and including February, 1874, at which time the aggregate falling off for the eight months of the fiscal year was \$589,564.09.

For March the profits were in excess of March, 1873, and at the end of June the increase over the corresponding four months of last year amounted to \$338,521.55, leaving a deficiency of \$251,042.54, as stated above.

Although this report is for the year ended June 30th last, it seems proper to add, in this connection, that the profits for the first quarter of the current year, which ended September 30th, show an increase over the corresponding months of last year of more than \$300,000.

The fiscal year is from July to June, both inclusive. A comparison of the business of the calendar years 1873 and 1874, shows that the profits of the 9 months of 1874, ended September 30th, are in excess of the 12 months of 1873; the excess during the 7 months ended September 30th being \$649,434.73, over the corresponding 7 months of 1873—an average increase of over \$100,000 a month.

The number of messages transmitted during the last year was 16,329,256, being an increase of 1,872,424 (about 13 per cent.) over the preceding year. Deducting from the gross receipts, moneys received from other sources than for the transmission of messages, and dividing the remainder by the number of messages, it appears that the average receipt for each message was about 55 cents. As the charge per message is for a minimum of 10 words, the average message must contain more than 10 words; so that the average receipt per message is necessarily greater than the tariff fixed for a 10 word message. A uniform tariff of 50 cents per message of 10 words between all stations on the Company's lines, without regard to distance, applied to the messages transmitted during the last year, would have yielded a revenue somewhat in excess of the actual receipts.

The tariff of rates now charged on the lines of the Western Union Company are but little above the average European rates. Considering the vast difference in the density of population, and the greater distances over which messages are sent in this country, and the cost of maintaining a greater length of line through sparsely settled sections, to reach the same number of people, and the higher cost of labor and of all material employed in telegraphic operations, the service in this country is relatively much cheaper than the average in Europe.

DUPLEX AND QUADRUPLUX TELEGRAPHY.

The Duplex apparatus of Mr. J. B. Stearns, by means of which two messages are transmitted in opposite directions upon one wire at the same time, has fully sustained the opinion of its utility and value which I expressed in my last Annual Report. It has been put in operation during the past year upon a number of additional circuits, and is now working successfully between all the principal cities. Its latest application was upon the lines to the Pacific coast, and it is now in use between Port Hastings, on the island of Cape Breton, where our lines connect with the cable wires, and San Francisco, a distance of nearly 5,000 miles.

But the past year has produced an invention more wonderful than the Duplex. Mr. Thomas A. Edison and Mr. George B. Prescott, the Electrician of the Company, have discovered processes and invented apparatus, by means of which two messages can be sent in the same direction, and two other messages in the opposite direction simultaneously upon one and the same wire. This invention, which they have christened the Quadruplex, has been in successful operation between our New York and Boston offices for the last two weeks, and is satisfactorily performing an amount of work upon one wire, quite equal to the capacity of four wires worked with the ordinary Morse apparatus.

The inventors claim that the Quadruplex may be used either as 1 wire, as 2 wires, 3 wires or 4 wires, as the pressure of business may require; that when it is worked as 2 wires, intermediate stations may be inserted, and may send and receive as with 2 separate wires in the ordinary way.

I have given much personal attention to the development of this invention in the belief that if it could be utilized to the extent claimed by its inventors, it would solve satisfactorily the most difficult problem which has ever been presented to the managers of Telegraph Companies, and that is: How to provide for the rapidly increasing volume of business without an annual expenditure for the erection of additional lines and wires that would prevent the payment of reasonable dividends to stockholders. So much has been accomplished already, and in so short a time, that it seems more likely that these predictions will be fully realized, than that the fulfillment will fall materially below the promise.

In my last annual report I made the following statement concerning the Duplex Apparatus:

"We are now operating more than 150,000 miles of wire, and during the past two years have been extending at the rate of nearly 20,000 miles of wire per annum. The Duplex apparatus is capable of doubling the capacity of these wires at a comparatively small cost. The value of this increase of facilities can be approximately ascertained by estimating the saving in the investment for wire, and the annual saving in repairs and maintenance of additional wires. But the great value of the Duplex does not consist in the saving in the investment in wires, and the cost of repairs and maintenance, but in its ability to double the capacity of a wire when we have but one, and when no amount of money previously invested in wires, or even possible to be expended in repairs, can provide another."

These remarks will apply with even greater force to the Quadruplex, if it shall prove capable of working through the same distances, and under like conditions as the Duplex. It is not easy to estimate the value of an invention which enables any and every wire between all the principal cities in the country, and between the Atlantic and Pacific coasts, to be made equal to two, in a minute, by merely turning a button; but it is very evident that the ability to practically convert one wire either into 2, 3 or 4, as

the convenience or necessities of the business may require, is still more valuable.

The Quadruplex, like the Duplex, is partially substituted for, and worked in connection with the Morse apparatus. No change in the ordinary operating force, nor any previous preparation of messages is required, as with the Automatic system, so that a continuance of the same simplicity and economy of manipulation and promptness of service which have characterized the Western Union Company's system of telegraphy is assured. All the essential patents for the Duplex are owned by this Company. Negotiations for the purchase of the patents of the Quadruplex are pending, but the terms will not be settled until after the character and extent of its capacity for work have been more fully ascertained.

"FAST" TELEGRAPHY.

This is the favorite designation given by its friends to what is better known as the Automatic system. Why it should be called "fast,"—in view of the fact that, before a message can be sent at all, more time must be spent in getting it ready for the transmission to begin than is required to send and deliver it in the ordinary way—I have never been able to comprehend.

In this review of telegraphic operations during the last year, it is only necessary to say concerning "Fast" Telegraphy, that the progress of its development has been exceedingly slow. The latest attempt to utilize it in this country was made in 1869, on a line of one wire between New York and Washington, and now at the end of five years it stands about where it began.

Although the evidence which I have accumulated is not sufficient to convince me that Automatic Telegraphy possesses any value to the Western Union Company, in view of its control of the Duplex, and of the probable utilization of the Quadruplex, yet I have not failed to give careful attention to the subject, and whenever it shall be demonstrated that any system of Automatic Telegraphy can be advantageously used on our lines, it will be promptly introduced. The claim that anything essential to the successful operation of Automatic Telegraphy—whether by the chemical paper plan of Bain, or the later one of Wheatstone—is covered by controlling patents, is without foundation.

RESUMPTION OF DIVIDENDS.

My last Annual Report concluded as follows:—"With the increase of wires already provided and now in progress, the capacity of which the Duplex apparatus will be able to double at small cost, it is believed that the constantly increasing volume of business, the growth of which will be stimulated by the present low and uniform rates, can be successfully handled with a less annual investment in new construction than has heretofore been necessary; so that, with competition checked, and in process of being extinguished, the percentage of expenses may be reduced, and the patience of the stockholders rewarded at an early day, by the resumption of regular dividends."

This prediction has already been verified. At the semi-annual meeting of the Directors, held on the 8d day of June last, a dividend of two per cent, payable out of the net profits for the quarter ended June 30th, was declared. The profits for that quarter were \$762,029.44. On the 2d day of September another dividend, for the quarter ending September 30th was declared. The profits of the second quarter were \$832,993.85. The excess of profits for the two quarters, over the amount required to pay the two dividends, is \$243,875.

It is the intention of the Directors to continue the policy inaugurated at the June meeting, and to divide the net profits quarterly hereafter, and to pro-

vide otherwise for the payment of such property as it may be deemed advisable to acquire.

Respectfully submitted,

WILLIAM ORTON,
President.

THE COLUSA, LAKE, AND MENDOCINO TELEGRAPH COMPANY.

The Colusa, Lake, and Mendocino Telegraph Company was organized in December, 1873, and since that time has built 170 miles of lines and opened 22 offices in a section of California which greatly needed telegraphic facilities. It is contemplated to build about 80 miles more line this season, and bring five more important points into connection with the telegraph system of the country. The officers of the Company are the same as the Princeton, Colusa and Grand Island Telegraph Company, of which it is an offshoot. Connection is had with the Western Union Company at Colusa.

This line was constructed and equipped entirely with material manufactured upon the Pacific coast, and is manned almost exclusively by Californians born and bred, at which circumstance the new Company manifest considerable pride. We also take pride in learning that the JOURNAL has been of great assistance to the operating force, and that it is regarded as a text-book in all matters pertaining to the art and the proper conduct of business.

NOTE ON MAGNETISM.—*M. Gauguain*.—The author's previous observations have referred to soft iron; he now takes up the case of steel. He magnetized horse-shoe bars by Elias's method, passing bobbins, in which a current was flowing, to and fro together along the branches. A single couple gives better results than a battery of several couples. The magnetization developed is very different according as an armature is kept applied or not during the operation. It depends also on the number and direction of the passes. A single pass from heel to poles develops a little stronger magnetization than a pass the opposite way. The maximum magnetization obtained (with the armature applied, and with twenty or thirty double passes) was nearly quadruple the magnetization obtained without armature, and with a single pass from the poles to the heel. These are wide limits. The magnetic intensity developed depends, in general, on the initial state of the bar, and it is necessary in many cases to previously demagnetize the bar. The author's former method for soft iron is here applicable. It is long, and there is a quicker process, that of rubbing the horse-shoe bar with a soft iron bar, drawn from the poles to the heel, but the demagnetization there is incomplete. *M. Gauguain* analyzed the modifications thus produced. Having brought the bar to a minimum state of magnetization, he traced the curve of demagnetization. Then he commenced rubbing in the opposite direction from heel to poles, and traced the curve of demagnetization. This latter was quite different; it is higher than the first, indicating that the magnetization is increased throughout the extent of the bar when the friction is directed from heel to poles, and diminished in the opposite case.

BANKS were first established by the Lombard Jews, in Italy. The first public bank was at Venice, in 1550. The Bank of England was established in 1693. In 1696 its notes were at twenty per cent discount.

JOURNAL OF THE TELEGRAPH.

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NEW YORK, NOVEMBER 2, 1874.

WHOLE NO. 168.

THE HUGHES PRINTING TELEGRAPH.

[Translated from Schellen's Elektromagnetische Telegraph.]

(Continued from Page 306.)

THE PRINTING AXIS AND THE PRINTING WORKS.

The printing axis $b_1 b'$ (Figures 7 and 8), which receives its motion through wheel N, is the most important part of the Hughes apparatus. It has a number of duties to perform. First: It throws the impression roller c , at the right moment, against the type wheel a . Second: After a letter has been printed upon the paper, it draws the latter forward to leave room for the next letter. Third: Its action upon the correcting wheel; and, Fourth: To raise the key n' to its first position after it has set the blank space in the type wheel immediately over the impression roller, and to connect the arrested wheels R and a with the rest of the wheelwork at the proper time. To effect these results, the axis is provided with four cams (Figure 9). The front cam m (Figure 10) effects the printing, as, at each revolution of the axis, it raises a forked arm $t t'$ (Figure 12), which has its center of motion at t . This arm carries the impression roller c , upon which is the slip of paper to receive the printed letters. As the cam m raises the arm, the impression roller with the slip of paper is thrown against that letter upon the type wheel, which is immediately over it. Similar action occurs at each revolution of the axis b_1 , which revolves in a less space of time than the $\frac{1}{10}$ part of a second. After each impression, the paper is drawn forward sufficiently to afford a clear space for the next letter. This is effected by the eccentric i . Behind the forked arm $t t'$ is an angular shaped lever $b' b''$ (Figure 12), which has its axis at b'' (right hand side) to the lower part of which is attached a flexible steel spring y , the head of the spring forming a tooth. To the impression roller c is attached a ratchet wheel with very fine teeth. As the impression roller is raised, the tooth y engages in the teeth of the ratchet wheel, and is raised at the same time with the lever $b' b''$, when, as the axis revolves, the eccentric i operates upon the lever, depressing it, and in the downward motion the tooth of the spring y turns the ratchet wheel, and thus moves the paper the distance required.

The third cam q (Figures 10 and 11) operates on the correcting wheel R to maintain the unison of the type wheels of the receiving and the sending instruments. To accomplish this unison, at every revolution of the axis the cam q gears into the teeth of the correcting wheel and accelerates or retards the motion of the correcting and type wheels, as may be necessary from their position. These wheels, being carried by a friction, yield very readily to the operation of the cam.

The fourth cam p (Figures 9, 10 and 11) has a shoulder, o , fixed parallel to the axis b' , which strikes against the lever Z (Figure 9) at each revolution of the axis, forcing it to the right at the moment that the key n' in front is pressed down. As

we have seen heretofore, at the pressing down of key n' , not only the coupling of the wheels R and a with the cog-wheel x (Figure 8) and the axis a is raised, but also that, in consequence of the catching of the lever K in the latch F, both wheels R and a come to a complete stand-still with the empty space

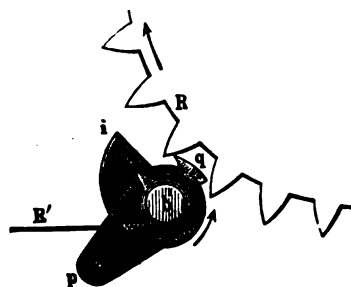


Figure 10.

of the type wheel immediately over the impression roller. When the key n' is released, the next revolution of the axis $b_1 b'$ brings the shoulder o against the arm Z, and thus n' I, Z, K, all of which form part of a lever with a common center of motion, are brought back to a position of rest. This movement

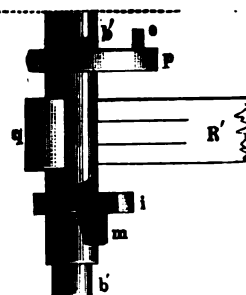


Figure 11.

of the shoulder o lifts the lever K out of the latch F, the detent S moves back, the tri-dental catch, which is fixed on R, engages with the teeth of the wheel x , and the wheels R and a are released and resume their rotation from axis $a' a'$, and revolve in harmony with the rest of the wheelwork. Thus, it

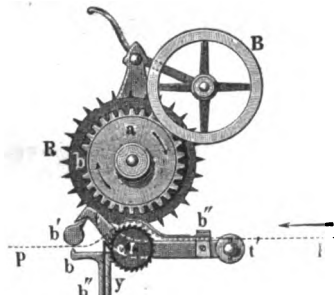


Figure 12.

will be seen, that depressing n' causes R and a to stop, and the empty space of the type wheel is placed over the roller c , while the remainder of the wheelwork continues revolving without interruption. At the first revolution of the printing axis b' , the shoulder o , upon the cam p , raises the key n' ,

and in so doing couples wheels R and a to the wheelwork, which continues its action.

The four cams upon axis $b_1 b'$, just described, are all upon the front part, b' , of the axis, which is connected with the printing work. The other part of the axis b_1 is not firmly united to the front part, but is rather coupled on to the front part at the moment that an impression is taken upon the paper from one of the letters of the type wheel. The rotation of the back part of the axis is continuous, owing to the permanent gearing of the wheel N in the gear 5 (Figure 8), but the front part, with the cams, remains inactive until, by means of a catch, both parts are united and revolve together. This connection is effected by the lever $d d'$ of the electro-magnet E E. Upon the depression of one of the keys of the keyboard, a pin, k (Figure 5), is raised, and the contact disc S of the sledge, in sliding over it, causes a current to pass through the coils of the electro-magnet which controls the movements of the lever, and, consequently, the action of that part of the axis carrying the cams.

[To be continued.]

RAILWAY SIGNALING.

Judging from the patent lists, there have been many inventors busy at work to render our system of signaling as faultless as possible. The specification of one, published last month, proposes to render the present system almost entirely automatic, and thus to reduce to the minimum the possibility of accidents occurring through the mistakes of signalmen, while, on the same arrangements, the signal is given on the engine itself, and the risk from inattention on the part of engine-drivers is greatly diminished. The invention may be briefly described as follows:—At certain distances along the line of railway strips of metal are mounted and suitably connected with relays and batteries. Other electrical apparatus is carried by the trains, and on coming in contact with the strips causes currents of electricity to pass through indicating apparatus carried by the trains, by which apparatus signals are given on the engine to the driver, informing him of the state of the line. The same current of electricity which gives the "line clear" signal to the driver passes by the telegraph wires to a station in the rear, and automatically "blocks" it by altering the position of a relay. The signals are thus given and received automatically by the agency of apparatus which is practically free from liability to derangement, and which is entirely independent of human agency. The signals being exhibited on the train, they cannot be hidden by fog, and the indications they are intended to give cannot be rendered obscure or doubtful, as is now the case owing to the contraction and expansion of the wires by which they are worked. In conjunction with the apparatus above described, it is stated that arrangements may be made for automatically locking and unlocking the points. The inventor is Mr. Whiteman.—*The Railway News.*

REPORT ON THE TELEGRAPHIC SYSTEM OF GREAT BRITAIN.

By R. S. COLLIER, Chief Engineer of the British Telegraphs.

[Translated from the *Journal Telegraphique*.]

Continued from page 307.

5.—WIRES.

For ordinary purposes No. 8 iron galvanized wire is made use of, having $\frac{1}{16}$ th of an inch diameter. For small lines No. 11 wire, $\frac{1}{32}$ th of an inch in diameter is used, and for the long lines No. 4 wire, having $\frac{1}{8}$ th of an inch diameter. These measures are almost the same as those adopted in France. In selecting the wire, more regard has been paid to its ductility and pliancy than to its tensile strength. It should be possible to stretch it out 18 per cent of its length, and to bend it several times both ways before it breaks.

It seems to have been proven that a wire, being once attached to its supports, never breaks except at the spot where it is defective, or very near to the solderings. Consequently it is deemed best to avoid the solderings and the joints, which also cause interruptions of communication, and to have the wires manufactured in as long and continuous sections as possible.

The $\frac{1}{16}$ th wire is manufactured at the present time in lengths of at least 400 yards, and our supply contractors are under obligations to furnish the wire in pieces as long as it is possible to make them.

For the purpose of discovering the flaws or defects in the wire it is submitted to a greater tension than that to which it is exposed when brought into service; this tension at the same time serves the purpose to make the defects disappear by breaking them up. When the first experiments were made to obtain this result, the wire had been placed at the foot of the poles attached to each extreme end, and drawn by hand in a rectangular direction of its length until it was all stretched out.

It is generally known that, when two wires touch each other in consequence of the action of the wind, the wrinkles or other irregularities of its surface, and especially the joints, predispose it to remain in contact. Besides removing those rugosities, the process of stretching also diminishes the action of the wind on the wires.

When two wires, one of which is stretched and the other is not, but which are alike in every other respect, are suspended parallel with each other, the one which has not been stretched will be made to move by the action of the wind, while the other will keep quiet.

The risks of getting in contact are thus very considerably lessened. As far as the wire is concerned, the experience of the British Postal Telegraph Department shows:

1st. That the wire should be manufactured in sections as long as possible, without any soldering or joint.

2d. That it must be stretched two per cent. of its length before it is attached to the poles, in order to break up all defects and make the wrinkles disappear.

3d. That the joints should be of as small a diameter as possible, so the wires will not remain together after being brought in contact by the wind. The joint called *britannia*, which consists in bringing the two ends of the wires together after having slightly bent the extreme ends, and binding them together with a small wire, and then run through a bath of solder, may be considered as perfect, and is less susceptible of causing contacts than the heavier and thicker twisted joints adopted in other countries.

For several years, the making of joints elsewhere than in the neighborhood of the poles has been forbidden, so as to make it impossible for them to touch any other wire. The joints do not give any surety as far as their conducting power is concerned, when they are not soldered; even then, the wires should be wound as solidly as possible. It is not sufficient even to cleanse the extreme ends and to have them surrounded by a metallic mass, as sometimes has been done. The same observation applies to any kind of junction exposed to dampness, whether this be an attachment-screw or a pair of tinned brass plates strongly screwed together, such as are used in the *testing-boxes* of the line, or at the extreme end of a tunnel. The electrolyzing, and consequently the corrosion, occur invariably when the joint is moist or ceases to be a good conductor.

A very commodious and useful soldering apparatus has been lately patented. It consists of a brass box about 4 inches long and 2 inches deep, provided with holes for the penetration of air, and a cavity placed in the upper part large enough to contain sufficient solder for a joint. This box is provided with a wooden mandrel. The fuel is charcoal mixed with other materials, so that it may rapidly blaze up and the fire be kept on.

USE OF WIRE OF LARGE DIAMETER.

The most decided effect of substituting wire of $\frac{1}{16}$ th of an inch for that of $\frac{1}{32}$ th of an inch (the latter being more extensively used), is the absence of the inconveniences resulting from defective insulation. This advantage has been actually demonstrated many times in practice. Comparing two wires put up between the same cities and equally well insulated, it has been discovered that by means of the large diameter wire the signals are reproduced distinctly, and that the communication is perfect, while in using the wire of small diameter the transmission is more difficult on account of the weakness and the variations of the current. The correctness of Ohm's law has been thoroughly confirmed by these experiences.

The effect of an increase of conducting power appears even more when use is made of a very rapid process of transmission, as, for instance, Wheatstone's automatic system. It has been noticed that on a distance of about 300 miles in a given time twenty per cent. more of words can be sent on the $\frac{1}{16}$ th of an inch than on the $\frac{1}{32}$ th of an inch wire, the line in this case less troubled by induction.

The results of these observations show that a ground wire connected to a submarine cable ought to be of large diameter, as the delay, especially in signals, is caused by the quantity (and also the arrangement) of the resistance of the land portion of the circuits.

UNDERGROUND WIRES.

The underground wires are placed in iron tubings, in the streets, and in earthenware tubes under the great highways. It is far easier to enclose the wires in a trough than in a pipe, and there is much less danger of damage to them; but, on the contrary, much more difficulty is experienced in making repairs in a trough. Practice, however, has shown that the process of putting a wire into a pipe cannot damage it, if proper precautions are taken.

When pipes are made use of, the entire wire can be replaced by a new wire, without interrupting the communication for a moment, and without having to remove the earth, except at the spot where the entrance chest is buried, while, if a trough is made use of, it becomes necessary to remove the ground its entire length, unless it has been constructed so as to allow the cable to come out, and in this case

the system would be more costly than that of the pipes.

The method in use in London for many years, and in the other large cities, consists in placing the pipes under the flag stones of the sidewalks, and to make them large enough to hold all the wires that may be wanted. Oblong entrance boxes of 30 inches in length, 11 inches in width, and 12 inches in depth, with iron covers, whereon flag stones, making up a part of the sidewalk, are placed at a distance of 100 yards from each other, when the circuit is on a straight line, and nearer each other when the circuit is turned. The pipes must be well cleaned and tarred inside, while they are warm, so as to prevent rust, because if this appears the wire sticks so much to the pipe that it is very difficult to remove it.

Sometimes the wires are joined as a cable for a length of 400 yards, slightly interlaced, and covered with tressed hemp, like the handle of a whip, but the usual method is to roll oakum around each wire; to simply tie them up together in a bundle, and to cut off the bands previous to the wires entering the pipes. In both these cases the *gutta percha*, as well as the oakum and the hemp, must be well coated with Stockholm tar. This tar protects the *gutta percha* far better than any other substance; on the contrary, gas tar damages it.

When a section requires renovating a new cable is inserted in an opening between this section and the next section, and this new part is introduced in the pipe at the same time that the defective pipe is taken out. The defective wires of the old cable are repaired in the factory. In this manner the entire line in the street may be renovated, without the communication being interrupted. When a new section of cable is inserted, care should be taken in adding spare wires, so that the section may not want renovating, unless several wires may have become defective.

It would not be practicable to remove more than half the number of wires at once, as the friction of one wire on the other would damage their covering. Neither could new wires be put in without much risk, unless the old and new wires connected in a cable have been covered with hemp or cloth. But this mode of covering a cable proves troublesome at times. When the envelope begins to rot or to be partially damaged, the defective part turns up and obstructs the pipe. But when the wires are separately covered the obstruction is avoided.

It is always convenient to make each of the joints at the same spot in the cable, so that they may be easily found, because, although the joints be made in the factory as solidly as any other part of the wire, they cannot be brought together as properly, or tested as carefully in the open air. The cables should be manufactured of a certain length, so that the joints invariably may be found at the same spot. The wires are labeled at each point where the joints have been made.

The expenses of laying underground wires are necessarily higher than those of the air lines; the cost being four times greater.

The unfavorable results obtained from the first systems made use of in laying underground wires, are due, partly, to the imperfections in the manufacture of the *gutta percha*; also, to the bad construction of the joints, the want of depth of canals, which exposed the *gutta percha* to the action of air and heat, the defective processes adopted for the ligatures, the imperfect methods for testing wires, and, in general, to the want of proper care in the execution of the work.

In order to succeed, every precaution must be observed in the laying of submarine cables, and the lig-

atures should be submitted to the test described in the latter part of this article.

Each conducting wire must be separately covered with an insulating substance: a single coat is not sufficient.

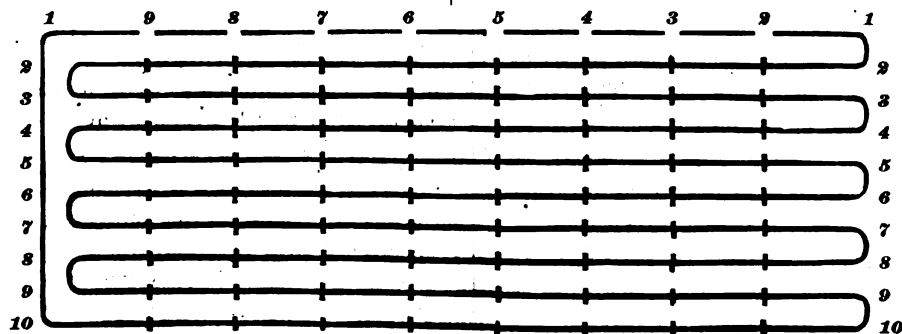
JUNCTIONS OF THE COVERED WIRES.

If, in this matter an expert workman is not employed, who may be held responsible for his work, the delicate operation of making the junctions should be trusted only to the superintendent of the line, whose duty it should be to repair the wires when they are defective.

Cleanliness is an essential condition for the proper execution of this work. The workman should make use of his fingers as little as possible, and they should be kept as clean as possible.

Previous to making the joint the gutta percha is removed a length of about $1\frac{1}{4}$ inch from the extreme end of the wire, and the brass wires are carefully scraped in order to clean them. The wires are twisted together for a length of one inch, and the extreme ends are carefully filed off. The joint then is soldered with common rosin and a liberal supply of soft solder, containing a sufficient quantity of tin.

The upper part of the gutta percha is scraped very carefully a length of two inches, in order to remove the exterior surface which is oxidated and would not join properly. The joint of the wire is coated with the Chatterton composition, and the gutta percha, heated upon both sides, is spread out on top of the joint un-



til both sides are brought together. The junction is completed by means of a hot welding tool, being careful to unite the gutta percha properly without burning it.

As soon as it is cold, another layer of the Chatterton composition is spread out on the gutta percha, taking proper care not to burn the composition.

Then a new sheet of gutta percha is heated by the flame of spirits, which sheet should be very clean, and, while it is heated, it is carefully spread out so as to make it slightly thinner. Next, while the gutta percha and Chatterton's composition are still warm the sheet is put on the joint, and is strongly pressed down all around with the index finger and thumb, after which the balance of the sheet is cut away by means of scissors. The junction is pressed anew and carefully finished by means of a red-hot tool, so as to properly unite the gutta percha of both extreme ends, as well as the cover of the wire.

The joint having cooled off, it is coated anew with Chatterton's compound, and is covered by a larger and greater sheet of gutta percha, which is handled exactly as the first sheet.

When the joint is finished, a new layer of Chatterton's composition is applied on the whole, which is shaped very carefully around the joint, and when this has cooled off it is rubbed down with the hand, well moistened, until its surface becomes smooth and equal.

The uniting of the old and new gutta percha is

very important, and the defects in the joints generally result from not having been done perfectly, or the gutta percha having been heated too much.

Testing of Underground Wires.

The separated wires or the cables must be carefully examined previous to their being delivered to the workmen who make the joints, and after the cables or the wires are joined, a test should be made of the different series of joints.

The work is divided in sections, varying in width according to the number of wires; at the end of each section the wires are not joined. In the other boxes or spots where the junctions should be made, the wires are joined, with the exception of wire No. 1, whose extreme ends are closed up, that is to say, covered with gutta percha.

In the first box, No. 1, the different wires are intertwined in the following order: 1 to 2, 3 to 4, 5 to 6, 7 to 8, 9 to 10. Tests are then made from the opposite side of the section (box No. 10) in order to see whether the springs of No. 1 are properly arranged, and whether the resistance of the copper and the insulation of the different wires are in good order. The extreme ends of the springs are then joined in box No. 10 in the following order: 2 to 3, 4 to 5, 6 to 7, 8 to 9, and 10 to 1.

The section is arranged as in the accompanying sketch.

It appears, in this plan, that the section represents a continued circuit, commencing and ending with

wire No. 1, but only interrupted on No. 1 at each chest.

The batteries and testing instruments are conveyed to chest No. 2 to test the first series of joints. The joints are taken out, properly cleaned, then put in a trough of insulated metal, partially filled with water and placed on top of the box or in the most convenient position; but great care should be taken that the trough be properly insulated, and the portion of the gutta percha which strikes the trough be perfectly clean.

The closed extreme end of wire No. 1, which ends in box No. 1, is then open, and the conductor connected to the instruments. Next a very exact examination is made of the insulating resistance of the entire section, noticing the exact deviation of the galvanometer needle; the wires are discharged, and the metallic trough connected with earth; then a new test is made, and when any increase appears in the deviation, it is caused by defective joints. The latter may be detected by putting the joints in water, one after another. The first test serves the purpose of determining the insulation of the entire section, independent of the series of joints to be examined, the latter being themselves insulated. The second test determines the insulation of the entire section with the series of joints. A defective joint immediately increases the deviation.

After the joints have been tested the wire No. 1 is

connected again for the continuing of the circuit, and the operation is repeated at the following box. When the last box has been tested, and wire No. 1 has been joined, it will be seen that the section forms a perfect continuous circuit.

Sometimes this process is slightly modified, when the deviation resulting from the loss of current is considerable. In such a case the slight increase caused by an insufficient joint cannot be noticed. The joints are put in the insulated trough and constantly charged with electricity by means of a powerful battery, the trough being brought in communication with a relay which communicates with earth across a very delicate galvanometer. The wire being charged, the current which has just escaped goes to earth through the galvanometer, which indicates its presence. In this test is not included the loss of current which is produced on the entire length of the wire, but only the direct loss which is caused by the joints placed in the trough. The defective joints are easily discovered.

The insulated trough used for these tests is made of copper. It is two feet high and eight inches in width, and ten inches in depth. It is insulated by means of four ebony feet, and provided with a screw on one of its sides for the holding of the wire.

LIPPMANN'S SMALL ELECTRO-CAPILLARY MOTOR.—

The following fact has been applied by Lippmann in the construction of a very novel small motor, producing 100 revolutions per minute, and which is so exceedingly sensitive to the slightest electrical current that its use for electrometrical purposes is suggested, as well as its possible adaptation to the reception of messages by ocean cables. If a globule of mercury, several millimeters in diameter, covered with water acidulated with sulphuric acid, and but slightly colored with bichromate of potash, in a glass or porcelain vessel, is touched on the side with an iron point, it at once contracts, thus altering its shape, again expands until it touches the needle point, then again contracts, and so on, giving rise to curious reciprocating movements. This peculiar effect is due to the alternate oxidizing and deoxidizing effect of the bichromate and iron on the mercury, whereby its capillary properties are modified; and a similar phenomenon is produced when the mercury is alternately connected with the positive and negative poles of a galvanic cell. In applying the force thus generated, on a large scale, Lippmann placed two vessels of mercury in a glass trough filled with acidulated water, and with pistons composed of capillary tubes filled with mercury, inserted into the vessels of mercury; the alternate contraction and expansion of the mercury in the pistons, as they are connected with one or the other pole of a galvanic battery, furnishing the motive power in the case.

TRAJECTORY OF THE ELECTRIC SPARK.—A. Tapier.

—The traces left upon surfaces of glass covered with a very thin layer of lamp-black by electric sparks passing from one pointed conductor to another, show under the microscope a regular structure. Sparks from 4 to 6 centimetres long generally trace a clear furrow 3 m.m. in breadth with a dark axis, the particles of soot being either projected laterally or accumulated along the axis. On the side of the positive conductor the trace of the spark is almost always ramified in bundles, which is not the case on the side of the negative conductor.

LABOR is the duty man owes to society; rest is the duty he owes to his person; recreation is the duty he owes to his mind.

CORRESPONDENCE.

BOSTON, Oct. 9, 1874.

To the Editor of the Journal of the Telegraph:

A man writes a message, motions that I am to take it, and leaves. It is addressed to a firm in another city with whom I am acquainted, but the signature is unfamiliar to me, and sender gives no address. In such a case, am I to send collect, or not send at all? Please answer in JOURNAL.

"CHICK."

Answer.—The message should not be sent collect unless properly guaranteed. But it does not appear that you did all that you should have done to prevent the customer from leaving before knowing whether his message could be transmitted or not, or that you endeavored to recall him.

STUART, Ia., Oct. 15, 1874.

To the Editor of the Journal of the Telegraph:

I send a message to John Hanks, "Grain Dealer," using no other directions, as they are unknown to sender. Now, should the words Grain Dealer be counted in body of message, or go as the supposed directions?

Answer.—A proper address is necessary to insure prompt delivery. Anything in furtherance of that end enures directly to the benefit of the Company, and should not be curtailed. It is only when superfluous or unnecessary information is written and the customer desires the transmission thereof, that the extra words should be charged for. A full and explicit address is desired for every message. In this case the term "Grain Dealer" seems to be necessary and should not be charged for.

To the Editor of the Journal of the Telegraph:

A customer asks the receiving clerk to write a message for him. He does so; the customer reading and signing the same. Subsequently an office message is received, saying "Party not at No. —." Upon reference to the original message, it is found that the number and the number mentioned in the office message agree. The customer, when informed of the contents of the office message, claimed that it was not the number given by him, and that the clerk is at fault for not writing it correctly; while the latter is equally as confident that it was written as he was told to write it.

Now, under these circumstances, should we send an office message free, furnishing the new address, or should the customer pay for it?

D. I. OGENES.

Answer.—Under these circumstances, the customer should pay for the message containing the new address. It makes no difference whether the clerk made the mistake or not. The sender, upon reading and signing the message, became responsible for its entire contents.

To the Editor of the Journal of the Telegraph:

Suppose Mr. B. sends a message requiring an answer to Mr. A., who receives it. He writes no answer, but tells messenger to reply "no." Should I write a message and send it or take no notice of it? By answering the inquiry through your valuable JOURNAL, you will greatly oblige.

Answer.—You should not write the answer. The messenger should have been provided with blanks, and have been sufficiently posted, that he could have explained to the customer that it was necessary that the message should at least be signed by the sender before it could be accepted. As it was, the messenger should have returned at once to the customer with this information, and have secured the answer.

To the Editor of the Journal of the Telegraph:

There are three questions I have to ask of you, which I would like to have answered in your columns, at your earliest convenience. They are these: 1st. There are in our office a battery boy, who attends to the batteries and assists in delivering messages, and a messenger, who delivers messages only. Now I would like to ask, in cases where special messages, upon which extra money has been paid, or has to be collected, for delivery, are delivered by the battery boy, to whom should this extra money go, the Company, the manager of the office, or the battery boy who delivers the message? 2d. Does Rule 99, which says, "all salaries must be paid at the close of each month," include the battery boys' and messengers' salaries, or are theirs to be paid a month after it is due? 3d. Are managers allowed to curse the boys for every trifling offense, or no offense at all, whenever they may feel cross, or for other like reasons inclined to do so?

I would also like to ask if there is any remedy for such conduct on the part of the manager, and if so, what is it?

INQUIRER.

Answer.—1. If the message is delivered by the battery boy during the time for which he receives compensation from the Company, the amount collected for the delivery of the message clearly belongs to the Company, and should be returned by the manager as extra receipts. If, however, the message was delivered by the battery boy during his own time, the money would belong to him. It would in no case belong to the manager of the office.

2. The rule which requires all salaries to be paid at the close of each month, includes battery boys, messengers, and all other persons employed by the Company.

3. Managers are not allowed to curse the boys for trifling offenses or for offenses of any kind, either when they feel cross, or otherwise, but are required to conduct themselves towards all persons, and on all occasions, in a gentlemanly manner. In case you are subject to improper conduct on the part of your manager, your remedy would be in writing to the JOURNAL.

To the Editor of the Journal of the Telegraph:

Please answer this question through the columns of your paper, and greatly oblige: Is one volt of power equal to one ohm of resistance? If not, how many of one equals one of the other? Many thanks. Yours respectfully, R. A. B.

Answer.—There is no equality, co-extension, sameness of quantity, similarity or analogy between the terms volt and ohm. A volt is a definite measure of electro-motive force, being nearly equal to that of a Daniell cell. An ohm is a definite measure of resistance, being nearly equal to that of 278 feet of No. 16 copper wire, or 300 feet of No. 8 iron wire, at 60 degrees Fahrenheit.

The quantity of electricity passing through a wire whose resistance is one ohm, from an electro-motive force of one volt, is always the same, and is called a veber or farad. An electro-motive force of one volt, when passed through various resistances, would give a strength of current inversely as the resistance.

For example: When one volt gave a deflection of 16 degrees upon a galvanometer through 23 ohms resistance, 43 ohms gave 9, 63 ohms 6, 93 ohms 4, 133 ohms 2½, 403 ohms 1, 1003 ohms ½. One volt is sufficient to work through the Atlantic Cable, which has a resistance of 7.778 ohms.

To the Editor of the Journal of the Telegraph:

Will you oblige me by answering the following questions:

First: Can a relay and a local sounder be made to

work on the same line, the sounder at one office and the relay at another office? A line from one to two miles long. How many cups of gravity battery would be necessary to make the line work? I have six cups and it won't work the relay at one office and the sounder at the other.

Second: What is required to prevent the formation of salts on the outside of the jars?

A SUBSCRIBER.

Answer.—1st. To work a line two miles long (of about 40 ohms resistance) with a relay of 110 ohms resistance at one end, and a sounder of two and a half ohms resistance at the other, will require twenty-five cells of gravity battery, resistance about three ohms per cell.

Two sounders of 2½ ohms resistance each may be worked well on a line two miles long, from six cells of gravity battery.

2nd. To prevent the formation of salts on the outside of the battery cells, and also prevent the evaporation of the fluid, add about one-sixteenth of an inch of cotton seed oil to each cell.

THE CINCINNATI EXPOSITION.

AWARD OF PREMIUMS FOR ELECTRICAL APPARATUS.

The fourth Cincinnati Industrial Exposition closed on the third of October. The following are the awards of premiums for electrical and telegraphic apparatus.

Best system of fire alarm telegraph, in operation, gold medal, National Fire Alarm Company.

Best fire alarm signal box, silver medal, National Fire Alarm Company.

Best telegraph battery, for force, durability and economy, silver medal, National Fire Alarm Telegraph Company.

Best electric light, silver medal, J. H. Wesling.

Best total annunciator, operated by electricity, silver medal, Telegraph Supply Manufacturing Company, of Cleveland.

Best switch for from four to twenty wires, bronze medal, Western Electric Manufacturing Company.

Best dial telegraph instrument, bronze medal, E. C. Armstrong.

Best lightning rod, bronze medal, David Munson, of Indianapolis.

Best general display of telegraph instruments and supplies, gold medal, to City and Suburban Telegraph Company.

Best type writer, silver medal, to the Western Electric Telegraph Manufacturing Company.

Best amateur telegraph instrument, bronze medal, to Charles Williams, Jr., Boston.

Best electric bell, bronze medal, to H. D. Rogers & Co.

Best electric medical apparatus, bronze medal, to the Western Electric Manufacturing Company.

Best insulator, bronze medal, David Brooks, Philadelphia.

Best electric clock, bronze medal, Howard Watch and Clock Company, New York.

Best insulated covered wire, for office use, bronze medal, E. F. Phillips, Providence, Rhode Island.

Best insulated covered wire, for line use, bronze medal, E. F. Phillips, Providence, Rhode Island.

Best electric gas lighting apparatus, bronze medal, A. L. Bogert, New York.

Best printing instrument, for private lines, bronze medal, to the Western Electric Manufacturing Company, Chicago, Illinois.

Best burglar alarm, bronze medal, E. Holmes, New York.

Best system telegraph call bells, for stores, etc., bronze medal, to H. D. Rogers & Co.

AMERICAN ELECTRICAL SOCIETY.

CONSTITUTION.

ART. 1.—This Association shall be called the American Electrical Society.

ART. 2.—The object of the Society shall be the interchange of knowledge and the professional improvement of its members, the advancement of Electrical and Telegraphic science, and the establishment of a central point of reference. Among the means to be employed for attaining these ends shall be periodical meetings for the reading of professional papers and the discussion of scientific subjects, the formation of a library, the collection of electrical instruments, models, drawings, maps, &c., and the publication of such parts of the proceedings as may be deemed expedient.

ART. 3.—This Society shall consist of members, corresponding members, and honorary members; and each person, when duly elected and qualified, shall receive a certificate of membership indicating the particular class which he represents.

ART. 4.—Candidates shall be proposed at one meeting and balloted for at the next regular meeting, and, to be elected, must receive three-fourths of the votes cast, but the Society may, by the unanimous vote of the members present, elect any candidate at the meeting at which he is proposed.

ART. 5.—On being elected, the candidate must subscribe to the Constitution and By-laws, and pay the sum of five dollars membership fee before he can be entitled to receive his certificate. If this be not done within sixty days from notification of election, said election shall be considered void.

ART. 6.—Persons residing out of America may be elected corresponding members in the same manner as hereinbefore provided for the choice of immediate members.

ART. 7.—Honorary members, having been nominated as required in Article 4, may be elected by a unanimous vote of the members present. They shall not be required to pay any contributions. No person shall be considered as a corresponding or honorary member unless he signify, within three months after notification of election, his acceptance of membership.

ART. 8.—Each person shall pay, as his initiation fee, the sum of five dollars, as provided in Article 5, and a further sum of two dollars per year toward the support of the Association.

ART. 9. No member whose dues are three months in arrears shall be entitled to vote, nor to receive the Society's printed papers.

ART. 10. Any member shall have the privilege of introducing strangers to the rooms of the Society, on writing their names in the Visitor's Register, or sending with them a card signed with his name.

ART. 11. There shall be a fund called the Fellowship Fund, devoted exclusively to the publication of the papers read before the Society. Any person, member or otherwise, may subscribe thereto.

ART. 12. At any regular meeting of the Society, fifteen members shall constitute a quorum for the reception and consideration of applications for membership, and the transaction of such business as may be reported by the Executive Committee.

ART. 13. The officers of the Society shall be a President, seven Vice-Presidents, a Corresponding Secretary, a Recording Secretary, a Treasurer, fifteen Directors, and an Executive Committee of five resident members, who shall be elected by ballot by a majority of votes at the annual meeting of the Society, and shall hold their offices until their successors are chosen and qualified; any vacancy that may occur, by resignation or otherwise, shall be filled at

the next monthly meeting, after notice of such vacancy.

ART. 14.—The President, Recording Secretary, Treasurer and Directors shall be the Trustees of this Society.

ART. 15.—The President, and in his absence, the Vice-Presidents, in rotation, shall preside at all meetings of the Society; and, in case of their absence, a President *pro tem.* shall be appointed.

ART. 16.—The duties of the Corresponding Secretary shall be to conduct all correspondence other than that relating to the local affairs of the Society.

ART. 17.—The Recording Secretary shall keep an accurate record of all the transactions of the Society and of the Executive Committee, and shall issue all notices, and prepare all necessary blanks.

ART. 18.—The Treasurer shall have charge of the funds of the Society; shall receive all assessments and pay all bills and orders approved by the Executive Committee.

ART. 19.—The duties of the Executive Committee shall be to have a general care of the affairs of the Society, examine and approve all bills and demands, audit the accounts of the Treasurer, certify to his annual report, and make report of their transactions for the year at their annual meeting.

ART. 20.—Initiation fees and annual dues shall be paid at the time the member elect subscribes to the constitution and By-laws, and regular dues at every annual meeting.

ART. 21.—The annual meeting shall be held on the third Wednesday of October in each year, at such place as the Executive Committee may designate. The headquarters of the Society shall be the city of Chicago.

ART. 22.—Proposed amendments to this Constitution shall be first submitted to the Executive Committee, then sent by letter to the several members of the Society at least thirty days previous to the annual meeting. Such amendments shall be in order for discussion and shall be voted upon at such annual meeting in person or by proxy. Votes shall be counted by the President and Secretary, and if two-thirds of the votes cast are in favor of said amendment it shall be declared adopted.

BY-LAWS.

1.—The regular meetings of the Society shall be held on the third Wednesday of each month, at which papers may be read relating to the theory and practice of telegraphy and electrical matters generally, or other subjects properly coming under the head of Article 2 of the Constitution.

2.—At the regular meetings of the Society the following order shall be observed in the transaction of business, unless set aside by a vote of members present:

First.—Record of the previous meeting to be read, approved and signed by the Chairman and Secretary.

Second.—Proposals for membership.

Third.—Candidates for membership to be balloted for.

Fourth.—Communications received since the last regular meeting to be announced and read, if required.

Fifth.—Communications from members present to be read.

Sixth.—Communications from the Executive Committee to be brought forward.

Seventh.—Report of Committees to be called for.

Eighth.—Unfinished business to be taken up.

Ninth.—New business to be proposed.

Tenth.—Questions for debate to be discussed.

3.—All decisions of the Chair on points of order shall be conclusive, unless reversed on appeal to the meeting.

4.—Every motion shall be first stated by the President, before debate, and every motion shall be reduced to writing, if the President, or any members, desire it.

5.—Cushing's Manual for the Government of Legislative Bodies shall govern the Society in its deliberations.

6.—If required by one-fourth of the whole number of members present, the yeas and nays, upon any question, shall be called and entered upon the journal.

7.—No motion for reconsideration shall be in order, unless one of the majority shall move such reconsideration.

8.—The Executive Committee may call meetings of the Society, when they deem it expedient, and shall be bound to do so upon the written request of seven members, stating the object of such meeting. Seven days' notice shall be given to members, of any special meeting, the purpose thereof to be stated in the notice; and no other business shall be taken up at that meeting.

9.—The rooms of the Society shall be open at such hours of every day as the Executive Committee may prescribe.

10.—A record of all donations to the Society, whether in money, books, maps, instruments, models, or other articles of value, with the names of the donors, shall be entered by the Recording Secretary, in a book provided for that purpose, to be kept at the rooms of the Society.

11.—The books, maps, instruments, and other property of the Society, shall only be removed from the rooms under such rules and regulations as shall be prescribed by the Executive Committee.

12.—The records of the Society shall, at all times, be open to members, and such books of account shall be kept in its rooms as the Executive Committee may designate.

13.—When a paper is presented to the Society, the Recording Secretary shall report thereon to the Executive Committee, who shall then determine whether such paper shall be published or filed.

14.—No indebtedness shall be incurred for the Society, except under such rules as shall be prescribed by the Executive Committee.

15.—No bill shall be paid for the Society, until it has been certified by the person authorized to contract it, and audited by the Executive Committee.

16.—Additions and amendments may be made to the By-Laws, at any regular meeting, *provided*, they have been proposed, in writing, and seconded at a previous regular meeting.

THE COMBUSTIBILITY OF IRON.

The combustibility of iron is a chemical fact well known, but a Berlin experimenter has demonstrated the phenomenon in a manner peculiarly his own. He takes a straight bar magnet of some power, and sprinkles iron filings on one of its poles. These filings arrange themselves in accordance with the lines of magnetic force, and, however closely they may appear to be packed, of course no two of the metallic filaments are parallel, and consequently a certain portion of air is enclosed, as in a metallic sponge. The flame of an ordinary spirit lamp or gas burner readily ignites the finely-divided iron, and it continues to burn most brilliantly for a considerable length of time, the combustion being, apparently, as natural and easy as that of any ordinary substance. If the experimenter with this operation stands on a slight elevation, and waves the magnet to and fro while burning, a most magnificent rain of fire is said to be produced.

TARIFF BUREAU. SEMI-MONTHLY CIRCULAR.

EXECUTIVE OFFICE,
WESTERN UNION TELEGRAPH COMPANY,
145 Broadway, New York, November 1, 1874.

To all offices on W. U. Lines:

The following changes and additions have been made since the date of the last circular:

GENERAL INFORMATION.

The office at Centreville, Cal., printed in the tariff book, is in Alameda Co.

Borden, Cal., closed.

Pleasant Ridge Park, Ky., should read Pleasure Ridge Park.

Messages taken for St. Mary's College, Ky., are delivered by a private line from Lebanon, Ky. The charges for delivery are collected at the college. Check business to Lebanon.

Hereafter the "tariff for other lines" from New Orleans, La., to South West Pass and Pass-a-L'Oulre, La., will be 100 and 5 instead of 200 and 10.

St. Helen's, Mich., re-opened; square 188.

Cunningham, Mo., re-opened; square 418.

Canaan, N. B., closed.

Barnaby's River, N. B., closed.

Millford, N. H., is now a W. U. office, square 28; check direct.

Wilton, N. H., is now a W. U. office, square 28; check direct.

The office at Cornwall, N. Y., will hereafter be open permanently, instead of during Summer months only, as heretofore.

Grieg, N. Y., closed.

Lake George, N. Y., closed.

Moose River, N. Y., closed.

Garysburg, N. C., re-opened.

Pleasant Hill, N. C., re-opened.

Bristol Centre, O., closed.

Rome, O., the new office on other lines given in JOURNAL of Sept. 15, is in Ashtabula Co.

Bismarck, Ont., closed.

Melbourne, Ont., closed.

Coyle's, Pa., changed to Great Belt City.

Greensboro, Pa., reopened, square 141.

The office at Martinsburg, Pa., square 112, printed in the tariff book, is in Blair Co.

Hereafter 25 cents additional should be collected for delivery on all messages sent paid to Mercer, Mercer Co., Pa. The town is one and a half miles from the office, which is at the depot.

Sheakley, Pa., re-opened; check Petrolia City.

Englewood, Texas, re-opened; square 488.

Lovelady, Texas, re-opened.

Milano, Texas, closed.

Lake Dunmore House, Vt., closed.

Piedmont, Fauquier Co., Va., changed to De La Plain.

Communications relating to checks or the business of Highgate Springs, Lake Dunmore House, Vt., and the White Mountain "Summer" offices in N. H., now closed, should be addressed to Geo. W. Gates, Dist. Supt., White River Junction, Vt.

NEW OFFICES.

Jamieson, Cal.

Sierra City, Cal.

* Stewart Point, Cal., 100 8 Petaluma.

* Centreville, Fresno Co., Cal., 60 130 Visalia.

208 Pine Bloom, Ga.

85 Fulton Sta., Balto., Md.

21 North Chelmsford, Mass.

28 Turner's Falls, Mass.

188 Buttonville, Mich.

179 Caro, Mich.

260 Grandville, Mich.

* Lockwood, Mich. 25 2 300 Grand Rapids.

409 Beamen, Mo.

429 Billings, Mo.

28 Greenfield, N. H.

33 Medford, L. I., N. Y.

40 New Baltimore, N. Y.

170 Barr's Mills, Ohio; P. O. A. Beach City.

180 Ehart, O.

213 Rome, Adams Co., O.; P. O. A. Stout's.

* Aberfoyle, Ont.

* Carlsruhe "

* Morriston, "

* Verona, Ont.

140 Dilks' Station, Pa.

140 Great Belt City, Pa. (formerly Coyle's).

140 Sarver's, Pa.

* St. Anselme, Que.

* Scott's Junc., "

175 Millett's Sta., S. C.

490 Gause, Texas.

* De La Plain, Va., 40 8 77 Alexandria (formerly Piedmont, Fauquier Co.)
316 Allen's Grove, Wis.

† For each additional five or fraction of five words.

ATLANTIC CABLE BUSINESS.

We are notified that the cable between Hong Kong and Amoy is repaired. Messages for Japan and for Shanghai in China, can now be forwarded as heretofore.

Code or cypher messages are not accepted for Greece.

WILLIAM ORTON, *President*.

TRANSFER SERVICE.

EXECUTIVE OFFICE,
NEW YORK, Oct. 81st, 1874.

On and after November 16th, Dover, N. H., and Ellsworth, Me., will be discontinued as money order offices.

CORRECTION.

Pensacola, Fla., is in C. G. Merriwether's district instead of in J. A. Brenner's, as stated in last JOURNAL.

GEO. H. MUMFORD,

Vice-Prest.

THE AMERICAN ELECTRICAL SOCIETY.

An adjourned meeting of those interested in the formation of an electrical society was held in the Palmer House, Chicago, on the afternoon of Oct. 21st. Mr. C. H. Haskins called the meeting to order and stated its objects, which are an interchange of knowledge and the professional improvement of its members, the advance of electrical and telegraphic science, and the establishment of a central point of reference. The constitution adopted provides that an annual meeting shall be held on the third Wednesday of October, at a place to be designated by the Executive Committee, that the head-quarters of the society shall be Chicago, and that it shall be known by the name of "The American Electrical Society." A permanent organization was effected by the election of the following officers:

President, Gen. Anson Stager, of Chicago. *Vice-Presidents*—C. H. Haskins, of Milwaukee; George B. Prescott, of New York; H. P. Dwight, of Toronto; William Orton, of New York; James Gamble, of San Francisco; John Van Horne, of Louisville, and E. D. L. Sweet, of New York. *Corresponding Secretary*, I. N. Miller, of Chillicothe, Ohio. *Recording Secretary*, C. S. Jones, of Chicago. *Executive Committee*—William Henry Smith, J. J. S. Wilson, George H. Bliss, F. H. Tubbs, and C. H. Summers. *Directors*—F. L. Pope, A. S. Brown, of New York; W. W. Smith, of Indianapolis; J. A. Swift, of Washington; S. D. Field, of San Francisco; George T. Williams, of Cincinnati; D. Flannery, of New Orleans; C. O. Rowe, of Pittsburg; R. C. Clowry, of St. Louis; E. P. Wright, of Cleveland; D. H. Bates, of Philadelphia; J. J. S. Dickey, of Omaha; N. Hucker, of Buffalo; A. G. Davis, of Baltimore, and J. R. Dowell, of Richmond, Va.

There were present at the meeting forty or fifty of the most prominent telegraphers in America, as well as many other prominent men interested in the science.

THE GREAT WESTERN TELEGRAPH COMPANY.

On Tuesday, the 13th ult., Mr. O. H. Horton was appointed Receiver of the Great Western Telegraph Company, and has taken possession of the lines and property of the Company. It is understood that at the expiration of sixty days the entire property of the Company will be sold, and its affairs closed up as speedily thereafter as possible.

THE TELEGRAPHERS' MUTUAL BENEFIT ASSOCIATION.

ACKNOWLEDGMENT OF RECEIPTS FOR ASSESSMENTS
UP TO AND INCLUDING OCT. 26, 1874.

ASSESSMENT NO. 69.

4, 5, 16, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 46, 47, 48, 49, 50, 51, 52, 53, 54, 55, 56, 57, 58, 59, 60, 61, 62, 63, 64, 65, 66, 67, 68, 69, 70, 71, 72, 73, 74, 75, 76, 77, 78, 79, 80, 81, 82, 83, 84, 85, 86, 87, 88, 89, 90, 91, 92, 93, 94, 95, 96, 97, 98, 99, 100, 101, 102, 103, 104, 105, 106, 107, 108, 109, 110, 111, 112, 113, 114, 115, 116, 117, 118, 119, 120, 121, 122, 123, 124, 125, 126, 127, 128, 129, 130, 131, 132, 133, 134, 135, 136, 137, 138, 139, 140, 141, 142, 143, 144, 145, 146, 147, 148, 149, 150, 151, 152, 153, 154, 155, 156, 157, 158, 159, 160, 161, 162, 163, 164, 165, 166, 167, 168, 169, 170, 171, 172, 173, 174, 175, 176, 177, 178, 179, 180, 181, 182, 183, 184, 185, 186, 187, 188, 189, 190, 191, 192, 193, 194, 195, 196, 197, 198, 199, 200, 201, 202, 203, 204, 205, 206, 207, 208, 209, 210, 211, 212, 213, 214, 215, 216, 217, 218, 219, 220, 221, 222, 223, 224, 225, 226, 227, 228, 229, 230, 231, 232, 233, 234, 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FLOATING TELEGRAPH STATIONS.

In answer to the question proposed in the *Philadelphia Ledger*, "Can it be done?" Mr. A. Patter, in *The Railway News*, refers to a paper on "Floating Telegraph Stations and Light Ships for Mid-Ocean" read by the late Captain Moody at a meeting of the Inventors' Institute held February 4th, 1869, in which he undertakes to show that the problem to be solved is to provide a form of vessel which could be moored on shoals or anchorage ground between Europe and America, so as to shorten the length of cable. To carry out this conception, Captain Moody invented and patented a vessel having four rays or arms proceeding from a central circular deck protected by iron bulwarks sloping out at the top with proper openings made through the deck to the interior of the vessel for companions and skylights, as well as large scupper-holes round the bulwarks to take off all water from the deck, so that even if it were possible for this part of the vessel to fill with water, it would all run out through the scuppers; nor would there be any danger of foundering, owing to the great buoyancy of the vessel, her clearing valves, her division into numerous water-tight compartments, and other internal contrivances. The vessel being also constructed to deflect the waves as they strike, instead of allowing them to break upon deck, as in the ordinary vessel, its unique form being admirably adapted for that purpose, and such as entirely to prevent it sinking or capsizing. Captain Moody suggested that, taking as an example an Atlantic cable, it should be carried in short lengths, by means of his floating telegraph vessels. The first of these he would place somewhere in mid-channel, with a cable from the Land's End. The next vessel off the Western Islands, and a third off the coast of America, from which the cable would be carried direct to New York. These floating stations could be utilized for various purposes. Ships on their voyages could despatch messages, large quantities of all kinds of stores and provisions could also be kept there for sale by passing ships, the stowage capacity of the vessel being immense. Shipwrecked people, who might be picked up, or who in open boats had succeeded in gaining the station, might be relieved while arrangements could be made with the mail steamers to call for letters and anything else that might be left at the stations. News of wrecks or disasters at sea could be sent through the cable, and assistance might be obtained for many a ship which otherwise would be lost. Life-boats could be kept at the stations, built upon the same principle, somewhat modified, for the purpose of saving life, rendering salvage services, and as a means of communication with passing ships; so that all these floating stations would thus become not only places of business but places of refuge in the very midst of the ocean. These stations could be boarded in all weathers; for, from their peculiar form, they could always be approached on the lee side, where the sea would be much broken, and perfect safety in boarding secured. In fact, these stations might be made the centres of communication by a simple system of cross cables. Captain Moody goes on to say that he thinks that he has proved that this form of vessel, with its immense strength, its great buoyancy, its steadiness, its power of deflecting the waves, its great internal room and the possibility of its being always kept moored in one position through its being moored in the form of a triangle, while other forms of vessel, however wide their beam, would at all times roll and swing with the tide, is the best for a floating telegraph station.

THE TELEGRAPH IN AUSTRALIA.

The report of the Queensland Superintendent of Telegraph shows that in that colony on June 13th, 1874, there were 3,203 miles of line, 3,931 miles of wire, 74 stations in operation, and 181 officers on the permanent staff. New telegraph extensions were under consideration.

The Parliament of Western Australia have voted the sum of \$75,000 for a telegraph line to Eucla, contingent upon South Australia commencing a line to the West Australian boundary.

The deepest sounding taken by H. M. S. *Challenger* between Sydney and Wellington was 2,600 fathoms. She found a bottom of sand and mud till almost within sight of New Zealand, when the bottom became rocky and shallow suddenly. This, it is said, removes the last element of uncertainty in the matter of submarine telegraph communication between Australia and New Zealand.

THE TELEGRAPH IN COLOMBIA.

The Government of the United States of Colombia undertook the construction of telegraph lines in 1864, and at present there are 1,600 kilometres in actual operation. These lines connect the Capitol with the principal northern towns of the Republic, and also with that part of Buenaventura on the Pacific where it will connect with the submarine cable, which comes along the southwestern coast of America from Peru and Chili, and which joins, at Panama, with the trans-atlantic cable, connecting Europe and America.

During the year 1873, the Colombian wires transmitted 50,000 telegrams, which produced \$14,000, giving a revenue to the State of \$10,000.

EASTERN EXTENSION, AUSTRALASIA, AND CHINA TELEGRAPH.—The total earnings of the company for the half year have amounted to £115,753, against £106,778 for the corresponding period of last year; the working expenses to £24,404; defalcations at Shanghai to £3,183; and the repair and maintenance of the cables to £3,099. Income tax and interest on debentures absorbed a further sum of £1,215, leaving a balance of profit for the half year of £83,852. One interim dividend of 1½ per cent., amounting to £29,962, has already been distributed, and another of similar amount is now declared, payable on the 15th October, leaving the sum of £23,927 to be carried forward to the next half year. The debenture debt has been reduced by £3,200, leaving a balance of £9,900, which will be paid off as the bonds become due. An interruption occurred on the China section of the company's cables, about forty-six miles from Hong Kong, in April last, and lasted about fifteen days, owing to the distance from the headquarters of the ship. On proceeding to repair it, it was found that the cable had been wilfully cut, and about one-and-a-half miles stolen. A reward was offered by the Government of Hong Kong, which resulted in the detection of the offenders, who have been convicted, and sentenced to fourteen years' imprisonment, and their junk has been confiscated. The directors have acknowledged with thanks the great assistance afforded them by the Government of Hong Kong in this matter. The company's cables are at present in good order, and working satisfactorily, with the exception of that between Saigon and Hong Kong, which is now interrupted. The maintenance ship *Agnes* is, however, proceeding to its repair. The directors have much pleasure in recognizing the efficient manner in which the land line connecting their terminus at Port Darwin with Adelaide has been maintained by the Australian Government.

WESTERN AND BRAZILIAN TELEGRAPH.—The traffic returns have been as follows: From opening of line to end of June, 1874 (for local traffic only), £16,000; since opening of Brazilian submarine line, giving communication with Europe, the returns show for July £7,668, for August £8,506, for September £8,957. During September there was an interruption between Bahia and Pernambuco for 17 days. Communication with the river Plate and West Coast of South America (save by land lines), also the West Indies and North America, was not yet established, but vessels with completed sections leave in November. In future traffic returns would be published monthly.

EASTERN EXTENSION (AUSTRALASIA AND CHINA) TELEGRAPH.—The directors have declared an interim dividend for the quarter ended June 30 of 3s. per share, being at the rate of 6 per cent. per annum.

The Government of the Cape of Good Hope have entered into contract with Messrs. Warden & Co., of Westminster, London, for the construction and equipment of several lines of telegraph in that colony and the Orange Free States of South Africa, which will place the Diamond Fields, and other remote parts of the colony, in connection with Cape Town. The construction of these lines will be attended with great difficulty, as the country through which the lines pass is, for the most part, uninhabited and without vegetation, food or water. The country is without roads, and forage and water for the cattle will have to be carried great distances. For some of the lines, we understand, iron poles will have to be resorted to, wood being unprocurable in the neighborhood, and its carriage from the coast fully four pence per pound.

A CABLE is to be laid from Callao to Islay, a distance of some 200 miles (over which soundings have already been made), and from thence another to Valparaiso. Following these the same company propose to lay a third between Callao and Panama, the whole to be completed by May 1, 1875, so as to place Valparaiso and intermediate points in daily communication with the United States and Europe. The company's agent has obtained very liberal concessions from the Governments of the countries interested. The Dacia and International are now fitting for sea, one of them to leave England with a working supply of cable early in October.

The total number of messages forwarded from the postal telegraph stations in the United Kingdom during the week ended Oct. 3d was 403,520, and during the corresponding week of 1873, 360,093; increase, 43,427.

The Brazilian Submarine directors state that from the 23d of June to the 25th of September, notwithstanding interruptions on the lines south of Pernambuco, the total receipts amounted to £24,471, equal to a profit of nearly 5 per cent. per annum.

A quarterly dividend of nearly 3s. per share upon both the preference and ordinary shares of the Globe Telegraph and Trust Company is announced, being at the rate of 6 per cent. per annum.

The Directors of the Globe Telegraph Company have declared the following dividends, payable Oct. 17th: 3s. per share on the Preference Shares, being at the rate of 6 per cent. per annum, and 3s. per share on the ordinary shares, being also at the rate of 6 per cent. per annum.

The traffic receipts of the Eastern Telegraph Company for the month of September, 1874, amounted to £28,208, as against £33,162 for the corresponding month of 1873.

Journal of the Telegraph.

This Journal is issued on the 1st and 15th of each month. Its circulation is over 8,000. It goes to every State, Territory and Province on the Continent. It has become a necessity, and is always welcomed as a friend. No better medium for advertising exists.

TERMS:

TWO DOLLARS PER ANNUM IN ADVANCE.

Address—

JOURNAL OF THE TELEGRAPH,

Western Union Telegraph Company,

145 Broadway, New York.

NEW YORK, NOVEMBER 2, 1874.

THE AMERICAN ELECTRICAL SOCIETY.

WE publish in the present number of the JOURNAL the proceedings of the American Electrical Society at the meeting in Chicago, Oct. 21st, together with the list of officers elected, and the Constitution and By-laws adopted for the government of the organization. The meeting was largely attended, principally, however, from the West, and the proceedings were very harmonious.

If the indications of the present may be taken as an augury of the future, this Society will take a high rank among the scientific associations of this country; but in order to achieve success, not only in standing, but in usefulness, it will be necessary to work. It will not do for any member to remain idle, content with the honor his membership brings, but every one must do his part fully in furthering the objects of the organization.

The new Society will have the full support and hearty co-operation of the JOURNAL in the endeavor to improve the telegraph service, and it will doubtless also receive the same earnest support from all who are in any way interested in the onward movement of the telegraph and the telegraphists of America.

This Society has been inaugurated upon a broad basis, and cordially invites Telegraphists from all parts of the country to become members.

HALF-RATE FRANKS.

We have received several inquiries regarding the manner in which messages taken under half-rate franks should be checked. Executive Order No. 143, published in the JOURNAL of February 1st, 1873, directs that such business be treated as follows:

"All messages sent under Half-rate Franks will be checked at full rates, and offices sending such messages will return them as *uncollected*, entering in uncollected account the uncollected one-half of the tolls, and forwarding the messages with their monthly reports as vouchers."

RESPONSIBILITY UPON COLLECT MESSAGES.

THERE is no class of business which entails more extra labor and of which the proper limitation is so little understood by managers and receivers, as that of messages which are accepted to be paid for at their point of destination. Two communications which we have received touching upon this subject affords us an opportunity to place the subject in its proper light, and in so doing we hope to bring it within the comprehension of all, and at the same time relieve ourselves of the unnecessary duty of answering substantially the same inquiries periodically.

In the first place it should be understood that the telegraph is under no obligation whatever to transmit a message, be it an answer or otherwise, unless the charges upon it are prepaid. Under certain restrictions, messages to be collected upon are accepted and forwarded wholly as a convenience to the public, but not as a right. For the amount of tolls upon such business the telegraph cannot assume any part of the responsibility. Whether the charges are prepaid or to be collected, the work of the telegraph in transmitting a message is the same, and, having performed that work, there should be no risk of the labor being unrequited.

Such being the position, it follows that any manager or receiver who accepts a collect message assumes all responsibility for the tolls thereon. And if the customer refuses to pay him for its transmission, he must either compel him to pay or sustain the loss himself as he would in any other case where he had trusted an irresponsible party. A receiver is not required to accept collect messages unless he is perfectly satisfied as to the responsibility of the guarantor. The kind or quality of the guarantee is necessarily left to the discretion of the receiver, who, upon the acceptance of an unpaid message becomes personally responsible for the amount involved.

Answers to paid messages are not entitled to be taken collect except when they are prepaid at the office of origin. When not so prepaid they should be treated in the same manner as collect messages which are not answers.

WE notice a great many strings and kite tails on the wires in various portions of the city. If they are not removed before we have another "spell of wet weather," some of the wires will work hard, and a good deal of "cross sympathy" will be manifested. Somebody ought to go for these kite tails with a sharp stick.

Mr. BEAR now explains that he was mistaken in stating that "two like currents pass each other on same line in opposite directions," and says he "should have said two unlike currents, or omitted the word like, and that his reason for using the word was because *like poles* or plates of batteries are connected to line at ends." It would now be in order for him to "rise and explain" how *like poles* can produce *unlike currents*!

THE NEED OF NEW RULES.

Under cover from one of our General Superintendents we have the following history of a message, which shows pretty clearly the need of definite rules to govern certain classes of business now done. Rules, it is true, cannot cover every case, and questions will arise even under the most perfect code, which a rule cannot solve. Yet in the case here given, and the correspondence to which it gave rise, may be seen one of the instances of unrequited labor which a careful code of rules should, to some extent, limit or prevent.

A message has been received for delivery beyond the free limit. The charges are guaranteed. No notice has come from the office of delivery so as to allow the guarantor to be released or enable the Manager to collect and settle the amount. Under these circumstances the following message was sent to the office of delivery:

"Has message to Bachus, signed Boxer, been delivered, and are guaranteed charges paid?"

This message passes through a main office, is seen by the Manager, and is reported by him to his Superintendent who endorses it as follows:

"Improper free office message, and is respectfully referred to the General Superintendent."

General Superintendent sends message to the Superintendent of the District where the inquiry issued, and elicits the following replies:

"The message was sent inquiring about a message sent (date) on which charges were guaranteed. We wished to know whether to collect charges or not, and as we had heard nothing, sent the message."

MANAGER."

"Respectfully returned to General Superintendent. I can hardly consider the service message an improper one. I have noticed several times the loss of money paid out for special delivery, and where the notification failed to get through. It will hardly do to take it for granted that if no notice is received that the charges have been collected. There seems to be a need of re-organization of this part of the service. DISTRICT SUPERINTENDENT."

Now here is a lengthy correspondence about a duty which seems capable of being made simple and clear. We might indicate what a rule governing it should be. We prefer to throw it out as a problem and ask a solution from those who read it. What shall the re-organization of the service in this department be?

THE TELEGRAPHERS' MUTUAL BENEFIT ASSOCIATION.

Before the issue of the next number of the JOURNAL, the annual meeting of the Telegraphers' Benefit Association will have been had, and action been taken upon the various subjects which have arisen during the past year; one of which, at least, will have a very important bearing upon the future of the Association.

The question which will be the most prominent in the deliberations of the Association, is the policy—not to say wisdom—of repealing that section of the by-laws adopted at the last annual meeting, which provides as follows:

"Any member who has become delinquent through failure to pay assessments, may be restored by a

unanimous vote of the Executive Committee, upon filing with the Secretary the proper form of application, and paying back dues, and an additional sum of one dollar and a half."

This may justly be termed a punishment clause, and it has had upon delinquents precisely the opposite effect from what was intended by its adoption. The back dues, which must be paid by delinquent members before they can be reinstated, are not only the unpaid assessments made during the life of their membership, but all which have accrued between the date of the lapse of the policy and the time of restoration. That is to say, a delinquent member is invited to resume the right he has forfeited, and as an inducement for his return, he must pay premiums for the time he was uninsured.

The enlargement of the Association and its consequent usefulness will be advanced by the unconditional repeal of this clause, and the adoption of a rule which will allow the return of delinquents upon payment of the amount honestly due, which is the unpaid assessments which accrued during the life of the policy.

THE CANADIAN PACIFIC TELEGRAPH LINE.

According to a telegram published in to-day's issue, the contract for the construction of the western section of the Canadian Pacific Telegraph Line has been finally awarded to Mr. F. J. Barnard for \$750,000—\$1,000 per mile for construction, and \$50,000 per year for five years for maintenance. The contractor is bound to fulfill the following conditions: To furnish all materials, labor, instruments, and everything to put the line in operation; to maintain the line for a period of five years after its completion; and in the wooded section the land is to be cleared to a width of 182 feet, or such greater width as may be necessary to prevent injury to the line from fires or falling trees. The Canadian Pacific Telegraph Line is divided into six sections, covering an approximate distance of 3,200 miles, and according to the *Ottawa Free Press* the highest tender for the construction of the whole line was \$5,000,000, the lowest \$1,250,000.

The notice calling for tenders says the line will be "along the general route of the Canadian Pacific Railway, as may be defined by the Government;" and as the contract for the construction of the British Columbia section has been awarded, we may reasonably suppose that the route of the railway through this Province has been decided upon for some time by the Government, and still this has been persistently denied by Mr. Mackenzie, who says he is prepared to commence the construction of the railroad as soon as the surveys are completed and the route adopted.

However, we will not attempt to reconcile the various and contradictory statements made in connection with the railway by Mr. Mackenzie, but will suppose that this great and costly telegraph line is to be immediately constructed. Telegraph communication is a great convenience in a sparsely settled country—a great luxury; in a thickly populated country it is absolutely necessary. But the idea of constructing a telegraph line through an unpopulated country in advance of either wagon road or railroad is certainly original, and shows that the Treasury must be either full to overflowing, or that the present rulers of the Dominion have discovered a new method of populating an unpopulated country by simply running a telegraph wire through it. But

the construction of our section of this great Canadian Trans-Continental Telegraph line in advance of the railway will add immensely to the population of the Province; for will not the contractor be obliged to import one or two hundred wood-choppers and stock the line with half a dozen operators? We all know the advantage to the Province of the present telegraph line from Cariboo to the seaboard; the miner gets his supplies over its wires, and the farmer and stock raiser conveys his beef and produce to market by the same means; large and thriving towns are centred around every operator's office along the line. On the completion of the Trans-Continental Telegraph line we have no doubt Montreal and Toronto merchants will be able to make "advance" contracts with the merchants of China and Japan for a supply of the productions of those countries.

But, seriously speaking, does not this quixotic idea of building a costly telegraph line through an unpopulated country—an unproductive work, the maintenance of which will cost the Dominion at least \$300,000 a year—look like another of the great Mackenzie's "shams?" Can we believe that Mr. Mackenzie would be so insane, so stupid, or so lavish with the public money as to spend five millions of dollars on a telegraph line, when he knows that the contractors in building the railroad would erect it for their own convenience for a tithe of this large sum? We believe that a few weeks' time will prove the Trans-Continental Telegraph line to be a mere sham to serve a present purpose. Correspondence is now being carried on between the Imperial and Dominion Governments in relation to the railway, and it will very much strengthen Mr. Mackenzie's position if he can produce the "sham" contract for a work which he wants people to believe is to clear the way for the railway. He will have no difficulty in finding sham contractors to suit his purpose. Failing to convince the Imperial authorities of the honesty of his intention to carry out the great national undertaking, he will possibly have recourse to the great game of "bluff," played so successfully by the Americans in dealing with British statesmen. The *Toronto Globe*—the chief organ of the Mackenzie Government—foreshadows the adoption of this "bluffing" policy when it says in a recent article that "not all the Queen's money and all the Queen's men could compel Canada to construct a foot of the Canadian Pacific Railway."—*The Cariboo Sentinel*.

THE DIRECT UNITED STATES CABLE.

The Faraday and Dacia having been coaled, and the rudder of the Faraday, which had been injured, having been repaired, at the last advices received the expedition was about to start from Queenstown to renew the attempt to recover the lost cable, and if successful, to endeavor to complete the laying of the cable to the coast of Newfoundland, where it was to be connected with the section already completed to Torbay, N. S., and Rye Beach, N. H. The lateness of the season renders the success of this attempt extremely problematical.

Mr. GEORGE F. DURANT, who for the last two years has been Superintendent of the American District Telegraph Company in this city, has resigned that position, having been appointed General Manager of the American District Telegraph Company at St. Louis, Mo., and has left for that city to enter upon the discharge of his new duties. Mr. Henry W. Pope, who has been Assistant Superintendent of the Company for the past two or three years, has been promoted to the vacancy caused by the resignation of Mr. Durant.

ARGUMENT OF MR. G. P. LOWREY UPON THE POSTAL TELEGRAPH BILL.

(Continued from page 328.)

Now, there is necessarily involved in a grant to set up telegraph lines on post-roads, which are private property, the exercise of eminent domain. I have said that there is no such right of eminent domain in the Government of the United States. Eminent domain is a right inherent in every sovereign to assume the title and possession of all private property within the territorial limits of his sovereignty, and to use it for public purposes. In the case of the sovereign who possesses unqualified sovereignty, the right of assumption of private property is comparatively unlimited. His judgment is absolute; although, in civilized nations, the sovereign has always consented to be himself controlled by the consideration, determinable judicially, whether the thing for which he requires the property is his own selfish purpose or the public good. A public purpose, in regard to every sovereign, is public only by reason of his relations to the use to be performed; whether they affect the public in a matter over which he has control, or whether they affect a public object concerning which he is charged with some degree of responsibility. In this country we have two sovereignties. There is the sovereign the United States, and the numerous sovereigns the States. Let us assume that we are now speaking within the limit of a State, and with reference to the application of such a law as Mr. Hubbard asks this committee to recommend. The public uses of the Federal national organization of the United States are all expressed in the Constitution; and those which are not there expressed are not deemed to be uses of this Federal organization. They may be public uses; but they are the public uses of the States within which the circumstances or occasions arise.

The public uses of the Federal National Government are uses which relate to war; which relate to the establishment of light-houses; to the establishment of post-offices and the various other functions confided specially and by State concession to the National Government. All the vast body of municipal public uses, such as the opening of streets, the opening of roads, the providing of water for towns and cities, the condemnation of land for railroad purposes, the condemnation of land for telegraph purposes, all abide in the States, and have never been conceded to the General Government.

Mr. STARKWEATHER. How do you discriminate as to the sovereign use of post-roads in the transmission of mails, &c.? That has been extended from time to time, from the former very limited purpose, to the use of letter-carriers, &c. How do you discriminate between sending messages by mail and sending them by wire?

Mr. LOWREY. I shall have occasion to remark considerably at length upon that discrimination; and perhaps I might do so with propriety at this point. I thought you were about to ask me to discriminate as to the exercise of power between post-office and municipal uses; and I should have answered that by saying that the post-office is one of the special uses confided to the General Government by the Constitution. It appears to me that one of the governmental uses is the establishment of post-offices, and that everything necessary for the performance of that use follows from the right. I have no doubt that if a recalcitrant State should decline to allow facilities for the transmission of the mails, it is within the power of the United States to enter within the domain of that State, and by such process as Congress may by law provide, call the owners of property into

Court to suffer condemnation of their lands for this national public use. I have no doubt that that can be done, because this special subject has been abandoned by each one of the States to the United States, under the specific name of the establishment of post-offices and roads. They were specific things, known to the law when the Constitution was adopted. All establishment of the system of communication by these particular agencies has been abandoned to the General Government, and nothing in connection with it has been reserved to the States.

Later on I shall come to distinguish between the business of transmitting information as such, and the transmitting of those parcels known as mail-matter by the post-office.

Mr. LOUGHRIDGE. I understand you to admit that if a State should refuse to allow a post-office in it, the General Government might in that case go in and establish it?

Mr. LOWREY. I think so.

Mr. LOUGHRIDGE. Suppose the General Government thinks proper to go into a State and build a post-road for the purpose of carrying the mails, do you doubt its power to do that?

Mr. LOWREY. Yes; I doubt that power at present. Let me, however, separate a little the subjects. I doubt the power, at present, because no provision has been made for the exercise of that power. Up to this time the United States has never attempted, by law or actual process, to possess itself of any property within the borders of a State except first by applying to the Legislature of the State. That is done with reference to custom-houses, which are for public uses as much as post-offices. It is done with regard to post-offices; and you will recollect, perhaps, the agitation over the question of the building of the great Cumberland road. You will recollect that it was with some difficulty that permission was obtained from the States of Maryland, Pennsylvania and Ohio to allow the United States to build that road for commercial and business purposes through their respective territories. And it is interesting to read the forms of the statutory enactments, and to notice the air of condescension with which the Legislatures of those States did agree that, for particular reasons, the United States might build this road.

The CHAIRMAN. Do you know any case in which the question has ever arisen in the Courts whether the United States has not, of its own right, the power, under the Constitution, to take property in the States for national uses?

Mr. LOWREY. Yes; the question has arisen in Michigan, in the case of *Trombley vs. Humphrey*, (23 Mich., 476.) There the opinion of the Court was delivered by Mr. Justice Cooley, whose opinions are entitled to very great respect on questions of constitutional law. He declared that a State enactment which followed precisely similar enactments of every other State in the Union, authorizing the General Government to go into the State Courts and ask them to condemn lands, was an unconstitutional enactment in the State of Michigan, because, he said, the limitations to the right of eminent domain are equal with the limitations of the public use which the sovereign exercising the right is obliged to perform.

The CHAIRMAN. I have always looked upon these negotiations between the General Government and the State government preliminary to taking ground for custom-houses, post-offices, &c., as rather a matter of comity and good neighborhood than of necessity.

Mr. LOWREY. I think you are right.

The CHAIRMAN. I have not the slightest doubt that the General Government has a right to go into

Ohio and condemn any piece of property for a custom-house or post-office, only that Congress would first have to make a law referring the matter to some United States Court.

Mr. HALE [to Mr. Lowrey.] Your proposition would be that, granted the right to establish post-offices, there follows from that a right to condemn and take land for that purpose without the consent of the State Legislature.

Mr. LOWREY. I think so.

The CHAIRMAN. Congress has not provided any general law for the condemnation of property, simply because it did not want to arouse apprehensions on the part of States that they were to be overridden without consultation. It preferred to take the property by the more polite method.

Mr. LOWREY. I think the General Government has the right to take property for post-roads; but it has not taken the property of railroad companies for post-roads. It might have condemned the land and constructed thereon and used roads as post-roads. In that case it must, like a private person, have made compensation. It has contented itself with using railroads as post-roads, and naming them as such. This gives them no more interest in, or control of, those roads than any other customer, traveler, or freighter. What I am complaining of is, that Mr. Hubbard's bill authorizes him to plant his poles in my front-yard, not because Congress has taken the property, but because Congress has said that Mr. Lowrey's court-yard is to be called a post-road. Congress cannot, by giving names, authorize a man's property to be taken from him. There is no provision in Mr. Hubbard's bill for compensation under any circumstances.

The CHAIRMAN. There is a fact which seems to throw some light upon this question, and I believe it is the only one of its kind. The site for a court-house and post-office in Cincinnati was condemned a few months ago in this way: It was condemned in the United States District Court, but it was by a special provision of the State Legislature, and of an act of Congress too. The construction of the two taken together led the Government to understand that it might carry those proceedings into the District Court of the United States, and the case was brought there. The question of the propriety of bringing it there was raised. It was claimed that that was an unconstitutional method of proceeding, but the court said that, because the State had consented to it, although the United States had no law for condemnation, the case might be tried in the Court of the United States, following the rules and order of proceeding, and the rules and evidence of the State of Ohio. The court decided that, for the time being, and for that particular case, the laws of Ohio were adopted as laws of the United States. There was a curiously mixed case. That came the nearest to a United States proceeding for condemnation that I know of.

Mr. LOWREY. There was a case precisely like it in Chicago in the condemnation of land for the Chicago post-office. The proceedings were taken in the United States Court under the authority of legislation of the State; and the power of the State to clothe a United States court with jurisdiction and to set it in motion to exert the eminent domain of the State was questioned in the same way. The case is reported in 2d Bissell, under the title of *The United States vs. Block*, 121. There was an interesting discussion, and the same decision was arrived at. In each of these cases the power which was exercised to take the property of the citizen without his consent was the power of the State, not of the United States. That the United States have that power for

all constitutional occasions cannot, I think, be doubted. (See 7 Opin. of Atty. Gen., 119, 320, 321.)

In the case in Michigan the question came fairly up as to the limitations between the eminent domain of a State and the national eminent domain. It is a case which I would like to refer to a little more fully, for what is there stated will throw light upon the whole subject.

In Cincinnati, in Chicago, and in Boston, in the case of *Burt vs. Merchants' Insurance Company* (106 Mass. 356,) the Boston post-office case, and in the case of *Gilmer vs. Lime Point*, reported in 21st California reports, and in various other cases in the States, it had been held that it was a constitutional exercise of power for a State to go upon property within its jurisdiction and to take it from the private owner, not for its own public use but for the public use of that legal stranger, the Government of the United States. In the case in Michigan the court denied the right of the State to lend its sovereignty in that way to another sovereign, and said that the eminent domain of Michigan is the right of that State to take (having made compensation) the private property of the citizen for the public use of the State of Michigan; that is to say, of the sovereign who takes the property. The purpose for which the land was sought in that case was to build a light-house. The State of Michigan, the court said, had nothing to do with the building of light-houses; that that was a public use of the United States, and the State of Michigan could take private property only for its own public use and not for the public use of the National Government. As a necessary corollary to that, the court added that the United States might ordain and use such proceedings by law as it saw fit, in order to take property in the State of Michigan or elsewhere for a constitutional public use of the nation. The court dismissed the suit, saying that the United States might come in its own authority and in its own right, and that nothing could resist it.

(To be continued.)

At a meeting of the Board of Directors of the American District Telegraph Company, held on October 13th, the following officers were elected for the ensuing year:

President—E. W. ANDREWS.

Vice-Presidents—A. B. CORNELL and J. N. GAMEWELL.

Treasurer—A. W. GREENLEAF.

Secretary and Assistant Treasurer—C. B. HOTCHKISS.

Superintendent—H. W. POPE.

Assistant Superintendent—F. D. FARRINGTON.

Superintendent Messenger Bureau—J. S. ASHURST.

BORN.

JONES.—At Uhrichsville, O., Oct. 13, 1874, to F. C. Jones, Agent and Operator L. S. and T. V. Ry., a daughter.

NORRIS.—At Pine Island, Mich., Oct. 14, 1874, to G. W. Norron, Jr., Agent and Operator L. S. and M. S. Ry., a son.

TRAXLER.—At Timmonssville, S. C., Oct. 4, 1874, to D. H. Traxler, Manager W. U. Tel. Office, a daughter.

VOELCKER.—At Bryan, Tex., Sept. 23, 1874, to Frank Voelcker, Manager W. U. Tel. Office, a son.

MARRIED.

JESSEN—MILLER.—At St. Marcus Church, New York City, by Rev. Mr. Regener, Fred. Jessen, Manager W. U. Tel. Office, Quarantine, Staten Island, to Miss Katharine Miller of New Brighton, S. I.

MORRIS—CRUNK.—At the residence of the bride, Decatur, Ala., Oct. 5, 1874, by Rev. J. W. Joiner, J. L. Morris, Operator at Shreveport, La., to Miss Bettie Crunk.

MUNSELL—WILLIAMS.—At the residence of the bride's father, Leighton, Mich., Oct. 18, 1874, by Rev. D. E. Hathaway, E. W. Munsell, Manager W. U. Tel. Office, Dorr, Mich., to Miss Alice E. Williams. No cards.

JOURNAL OF THE TELEGRAPH.

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NEW YORK, NOVEMBER 16, 1874.

WHOLE NO. 169.

THE HUGHES PRINTING TELEGRAPH.

[Translated from Schellen's *Elektromagnetische Telegraph.*]

(Continued from Page 321.)

THE ELECTRO-MAGNET AND THE RATCHET OF THE PRINTING WORK.

Figure 13 represents the action of the electro-magnet E upon the printing work of the Hughes apparatus, and also the arrangement for coupling the two parts, b_1 and b' , of the printing axis.

The cores of this electro-magnet are not connected together at the back by a cross-piece of iron, as in the case of an ordinary electro-magnet, but, as shown in Figure 14, they are attached to the N and S poles of a powerful steel magnet. The action of this magnet upon the cores is regulated by means of a small bar of soft iron placed on the legs N and S, which can be moved up or down. The nearer it is placed to the end of the poles the less will be the magnetic effect upon the cores of the electro-magnet.

By this arrangement the cores are constantly magnetic, and attract the armature, which forms part of the anchor n (Figure 13), as long as no current passes through the coils. A strong steel spring, r (Figure 1), operating on the lever F of the anchor, serves by its retractive power to withdraw the anchor, when, by the passage of a current through the coils, the magnetic power of the steel magnet is neutralized. In order to avoid too strong an attraction, the armature does not touch the surface of the poles, but is separated a space equal to about the thickness of an ordinary sheet of paper.

When a current whose polarity is opposite to the polarity of the steel magnet is passed through the coils E E the power of the steel magnet is weakened or neutralized, and it no longer holds the armature against the retractive force of the spring r , which immediately draws the anchor upward with considerable power. This movement of the anchor is transmitted on the two-armed lever $d d'$, which has its center of motion at the axis H. One end of the lever rests, with an adjusting screw, on the top of the anchor; therefore, when under the action of the current, the armature is released and flies upward, the arm d is raised with it, while the other extremity of the arm d' goes downward, and it is by this movement that the coupling of both printing axis $b_1 b'$ (Figures 7 and 8) is effected, and the motion of the wheel-work transmitted from the gear 5 to the front part of the printing axis b' and its four cams.

The transmission of this motion is effected in the following manner. On the back part of the printing axis b_1 a wheel g (Figure 13) with very fine and powerful teeth is fixed. On the front part of the axis b' is a circular sector $l l'$, on one side of which is a flyer c' , to which is attached a detent c'' . This detent has three teeth which gears into the teeth of wheel g .

On the other side of the sector is a spring v which presses down the geared detent, which, with its flyer c' , is allowed to rise and fall a little. When it is free, as represented in Figure 13, the spring v presses c'' into the teeth of wheel g , in which position it is carried by the wheel, which revolves in the direction indicated by the arrow, and the rotation of printing

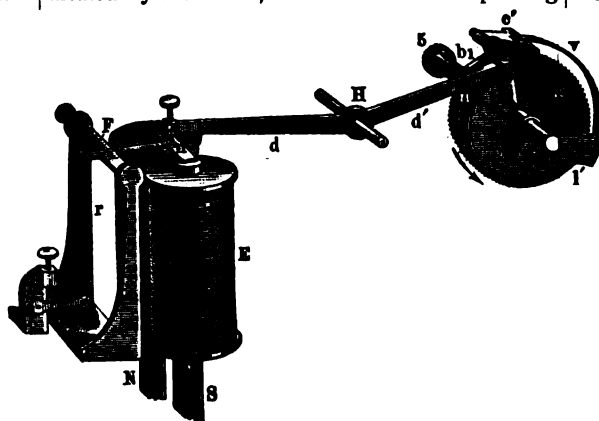


Figure 13.

axis b_1 , at once effects the revolution of the sector $l l'$ and the axis b' . When, however, $c' c''$ is raised, its teeth leaves the wheel g ; the latter continues to turn whilst the sector and the axis come to a stand-still.



Figure 14.

The sector $l l'$ also carries an eccentric bow u which raises the end d' of the arm, when by the action of the anchor n it has fallen. This movement presses the anchor against the poles of the magnet

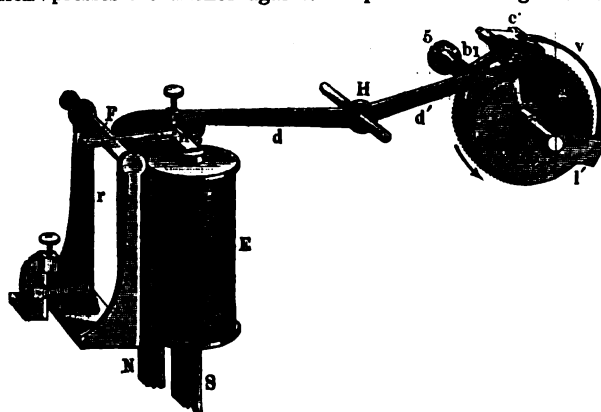


Figure 15.

where it remains attracted by the permanent magnetism of the cores so long as no current passes through the coils. When in the position shown in the engraving, the sector $l l'$ turns in the direction of the arrow, and after making half a turn the front part (in Figure 15 the lowest part) of bow u slides under

the extreme end of d' , when, as the following end of the bow is farther distant from the axis b' than the front end, the extreme end of d' on the bow is raised and the other end of the lever, d , consequently falls, and the adjusting screw presses the anchor against the poles of the electro-magnet.

In the drawing the end of the bow has not reached the end of the arm d' , therefore this end lies somewhat deep and the geared detent is still into the teeth of wheel g . When the axis b' is turned a little farther, d' will have reached its highest position, and d will be lying on the poles of the magnet. The axis b' , sector $l l'$ and $c' c''$ continue turning; but when the revolution of the axis b' is nearly completed, the flyer c' , to which is attached c'' , reaches the sloped end of the arm d' , which is now firmly held, and moves upward, lifting c'' out of the teeth of wheel g . By this the printing axis b' is disconnected from b_1 and the revolving wheelwork, and is brought to a stand-still, which continues until the arm d' again falls owing to the release of the anchor armature by a current passing through the coils, when the flyer c' is set free; c'' again catches into the wheel g , and thus both b' and b_1 are coupled anew. It will be seen that the printing axis b' makes an entire revolution at each action of the electro-magnet, and that the movement of anchor n and the release and activity of the printing work is effected exclusively through mechanical power, and not by the power of an electric current. The current, during the very short duration, merely weakens or destroys the permanent magnetism of the cores of the magnet, at which the spring r raises the anchor n and through the lever $d d'$ regulates the motions of the printing work.—(To be Continued.)

QUICK TELEGRAPHING.

Several instances of quick telegraphing have been brought under our notice of late, but the following shows the perfection to which the cable telegraph service has been brought. A message was sent from New York to London, and in thirty minutes, actual time, the answer was received in New York. Another dispatch was sent to London, to which a reply was received in thirty-five minutes actual time. In neither of these instances was any special effort made to hurry the answers, but the party addressed sent the reply to the London office by the messenger delivering the original message.

To fully appreciate this wonderful achievement, we must consider that the distance from New York to the cable station at Heart's Content, N. F., is about 1,300 miles, that of the cable about 2,000 miles, and of the land lines and cables from Valentia to London about 300 more. Each message, therefore, was transmitted about 3,600 miles, and passed through the hands of eighteen persons, all told; consequently, the message and reply, in each case, passed through the hands of thirty-six persons and traveled over 7,000 miles in thirty to thirty-five minutes.—*The Telegraphic Journal.*

RESEARCHES ON ELECTRICITY PRODUCED IN MECHANICAL ACTIONS.

From the Telegraphic Journal.

THE electricity developed in friction and pressure has at various times attracted attention; observers having studied chiefly the variations of electric tension with the nature and state of the bodies, the mode of mechanical action (including the time of action and the velocity of separation), the pressure of bodies rubbed or simply pressed, the form and dimensions of bodies, and the influence of temperature.

A French physicist, M. Joulin, has recently made a fresh investigation of the phenomena, bringing some new facts to light. His memoir, dealing with the subject in considerable detail, will be found in the *Annales de Chimie et de Physique* for May. A few words first of all on the historical part of the question (to which one of M. Joulin's chapters is devoted) may not be without interest.

As regards friction, the first observers thought the sign of the electricity developed depended simply on the nature of the bodies. Lists were given, in which each substance was positive with those before, and negative with those after it. Cavalls, Bergmann, and Faraday held that metals rubbed with most bodies are negative. Experiments by Canton and others proved that roughness has a negative tendency. Pecllet, in 1834, studied the influence of different circumstances of movement, experimenting with a glass cylinder turned at different rates, with a rubber pressing against it. He considered that the tension increased during a short time, after which it remained constant; that the same quantity of electricity was produced each turn, whatever the rate; that pressure was without influence on the tension; and that friction of sliding and of rolling gave the same electric tension. He also studied the effect of size; with the same length of rubber, the breadth and thickness were without influence; with conducting rubber, the quantity of electricity in the cylinder diminished when the curvature of the edge of contact increased.

As regards pressure, it is chiefly M. Becquerel who studied the laws of development of electricity by it. He found—(1) That, with the same velocity of separation of pressed bodies, the tension of the electricity was proportional to the pressure; (2) that, with the same pressure, the electric tension increased with the velocity of separation. As to temperature, Coulomb (in 1785), rubbing heated strips of paper on woolen or silk stuffs, found them, successively, negative without electricity, and positive as the paper cooled. Bergmann, Dessaignes, Pecllet, and others have observed that heat gives to bodies a negative tendency. M. Becquerel remarks that a slight difference of temperature between similar pressed portions of the same body suffices to cause liberation of electricity by pressure.

All these phenomena have been referred to three kinds of causes—the *molecular vibrations* produced by mechanical actions; the *chemical phenomena* accompanying them; or the existence of *electromotive forces* acting in simple contact of two bodies chemically or physically different. Coulomb and Becquerel have held the first view. Wollaston considered the electricity in frictional machines was due to an alteration of the oxidisable amalgam of the cushions; but, after Gay-Lussac and Pecllet made a machine act in dry carbonic acid, the chemical explanation was abandoned. The third-mentioned view has been enunciated by Pecllet, Gauguin, and others.

M. Joulin was attracted to the subject by phenomena of electricity of tension observed in leather belts employed in some factories he visited. He got

machines constructed so that the mechanical tension of the belt could be varied at will (drawings of these are given in elevation and plan). The motor pulley was mounted on fixed supports, the moved pulley on sliding supports, and the tension was varied by means of weights connected by a lever, &c., with these sliding supports. The conducting bodies employed for pulleys were iron, brass, zinc, red copper, white iron, lead (the last four metals applied in their laminae to wooden pulleys); the imperfect conductors, walnut-wood, leather, hardened caoutchouc, in laminae of 12 m.m. thickness applied to wood; cloth and silk fastened in the form of cushions on wooden pulleys. The pulleys were of various dimensions and form.

(The author further describes the variations of conditions of movement in these new machines, and the modifications the belt underwent in hygrometric and elastic state. In the next chapter he explains the process of measuring the electric tension. The fourth is a study of the distribution of electricity; and the fifth treats of the variations of electric tension with different circumstances, nature and state of the bodies, form and dimensions of pulleys and belts, and temperature). The following is a *résumé* of M. Joulin's conclusions:

The new machines, formed of a metal and of leather, a substance of imperfect, but sufficient conductivity, present, in the latter body, electric tensions of surprising intensity. Independently of the long aigrettes and sparks which could be had, a metallic wire brought near the belt was traversed by a continuous current powerful enough to deflect the needle of a galvanometer with electricity of tension, to weakly decompose water, and, in slightly modified Geissler tubes, to produce a distinct stratification of the electric light. A study of the distribution in different parts of the machine shows that the electricity developed at the moment of separation of the two bodies spreads over the leather in virtue of the laws of conduction, and produces in it a permanent state of current, to which corresponds the free electricity perceived.

The first experiments gave proof of the enormous influence which the two essential conditions of the movement—viz., velocity and mechanical tension, varying within much wider limits than those of previous experiments—have on electric tension. It was sought to determine the variations of this latter inflection of the velocity and the mechanical tension simultaneously with the influence of the other circumstances studied. The state of movement of the electrified body, and the rapid variation of the tension, necessitated the employment of a new method for measuring the electric tension, based on the observation of the greatest distance at which was produced the aigrette of minimum intensity, perceptible in the same sphere brought near to the electrified body. It was found that, all other things equal, with two bodies of given nature, cast-iron and leather, when the velocity is made to vary in a continuous manner, the traction of the belt remaining constant, the electric tension varies algebraically in a manner also continuous, and that when the traction is varied, the velocity remaining constant, the electric tension varies in a continuous manner, either algebraically or in numerical value. If the velocity and the traction vary simultaneously, there is a superposition of their effects in the electric tension. Lastly, the proportionality of the variations of electric tension to the variations of each of the conditions of movement appears, within certain limits, to be the first approximation of the law of variation. Observation as to the influence of the various circumstances, dimensions of different parts

of the machine, temperature of the system, or of one of the bodies only, state of surface, equally showed the continuity of variation (algebraic or in numerical value) of the tension, and the superposition of effects if several circumstances are made to vary at once. Endeavoring to synthetise the results, one is led to say that, for the same couple, the circumstances influencing the electric production may be referred to three causes—separation, more or less rapid, of the bodies; the complex mechanical action of incurvation, depending, in the case of leather, on elastic state and dimensions of the pulley, and the number of incurvations in a given time; lastly, the common temperature of the two bodies, or that of one of them.

The algebraically-continuous variation of the electric tension seems to show that there is not occasion to consider, so much as has been done hitherto, the sign of this tension. And if we compare the results obtained with the new machines with effects previously observed, it will be found that the nature, the state, the dimensions of the bodies, and the temperature intervene most often in a manner contrary to that which has hitherto been supposed. It is probable that, when electrification shall have been studied sufficiently, the general law of variation will be discovered; it will then be possible to abandon all these entities—friction, pressure, exfoliation, cleavage—and to say that the phenomena of electric tension always accompany the separation of two bodies the surfaces of which have been brought so close together that the molecular forces have been called into action.

"The algebraic variation" (M. Joulin goes on to say) "of the electric tensions, with the continuous variation of circumstances, and the displacement of the point where the tension is *nul*, along the scale of variations of circumstances studied, have seemed to me of a nature to confirm the ideas which led Franklin to create his terminology; ideas the expression of which will in vain be sought for in the works of the eminent American. Varying in a continuous manner, then, the electromotive force produces tensions successively negative and positive, connected with one another by the law of continuity; and we perceive that the point where the tension is *nul* has not the importance which has been accorded to it hitherto; that it is a simple accident in the scale of variations of electric tension, due, perhaps, to the equality of the electric state of the body with that of the surrounding medium; and that it is from having magnified this fact that so many anomalies have been accumulated in the chapter of production of electricity by mechanical action. For the rest, it is not the first time that this law of algebraic continuity has been met with.

In thermo-electricity, M. Becquerel has long since made us acquainted with couples which, on the temperature of one of the joints being gradually elevated, give currents increasing in intensity up to a certain temperature, decreasing above that to zero, changing direction and increasing anew. Whatever difference there may be in the manifestation of the electric force here by a current, in one experiment by phenomena of tension, it may be admitted that in both cases this force varies in a continuous manner; and the new experiments thus lend support to the theoretical conclusions arrived at by M. Le Roux in his admirable researches on thermo-electric currents.

THE number of messages passing over the Cuba Submarine Telegraph Company's line during the first fortnight of September was 916, estimated to produce £1,000, against 641 messages, producing £850, for the corresponding period last year.

EXPERIMENTS ON THE DISSIPATION OF ELECTRICITY BY FLAMES.

By J. W. FEWKES.

By means of an electrometer made on the principle of Sir William Thomson's quadrant, I have been able to perform a few experiments in relation to the dissipation of small quantities of electricity by different kinds of flames.

These experiments were conducted with such small quantities of electricity as could be obtained by rubbing a vulcanite plate six inches square with a catskin. The sensitiveness of the electrometer to the electricity thus formed was very great. The experiments are given below.

Experiment 1.—An alcohol lamp, carefully insulated, was connected with the electrometer. The sections of the quadrant to which it was attached were then charged by means of the vulcanite plate, the opposite sections being at the same time in connection with the earth. The lamp was then carefully lighted. The spot of light, which had been deflected to the edge of the scale by the charge, quickly returned to the zero point, indicating a quick dissipation of the electricity by the flame.

Exp. 2.—The same conditions as those in *Exp. 1.* were observed, with the exception that a Bunsen burner was substituted for the alcohol lamp. The dissipation of electricity was the same as before, and took place, as near as could be observed, at the same rate as before.

Exp. 3.—I then substituted for the Bunsen flame a very fine jet of light, obtained by passing the gas through a finely pointed glass tube. The results obtained from this experiment indicate that the rate of dissipation is in no respect related to the size of the flame.

Exp. 4.—The end of the wire connected with the quadrant was then placed so that when the gas was lighted the wire point would be in the flame. The quadrant was then charged and the gas turned on without being lighted. The spot of light had no movement, and gave no sign of any loss of electricity by the quadrant. An artificial current of air across the wire point likewise had no effect in dissipating the charge.

Exp. 5.—The end of the wire was then placed in the jet of an atomizer, the same conditions being observed as in *Exp. 1.* The fine globules of steam and water issuing from the atomizer had no effect in dissipating the electricity of the quadrant.

I also performed two very striking experiments, which seemed to have some bearing upon this subject. The instruments used were the same as in the former experiments and the manipulation was as follows:

Experiment 1.—Carefully insulate a wire communicating with the electrometer, and place its point within a few inches of the flame of an insulated Bunsen Burner. Let the spot of light be at the zero point. Electrify the vulcanite plate with the catskin and hold it at an equal distance from flame and wire point. It is very difficult under these conditions to sufficiently electrify the quadrant so as to produce any deflection of the spot of light.

Exp. 2.—Place the wire point in the flame and then hold the electrified vulcanite plate up to the flame as before. The spot of light immediately is violently deflected, indicating the presence of electricity in the quadrant. This change, however, is soon dissipated by the flame, and the spot quickly returns to the zero point.

These last experiments seem to indicate that the flame has a much greater attraction for the electricity of the vulcanite plate than the copper point

of the wire. Hence the difficulty of charging the quadrant in the first experiment.

When, however, the wire is in direct communication with the flame, as in the second experiment, the flame and the quadrant are at the same potential, and the increase of electricity in the flame produces a corresponding deflection of the spot of light.

POLARIZATION OF THE PLATES OF CONDENSERS.

By A. S. THAYER.

It is well known that in polarization batteries, of which Planté's battery is a type, a combination of the ions, resulting from electrolysis, takes place when the plates of the battery are connected, and a current results which slowly diminishes in strength. In the case of condensers made with solid dielectrics the same diminishing current is observed, and the following experiments would seem to show that it might be due to an electrolysis or decomposition of the material separating the plates of tin-foil. The experiments consisted in placing condensers of various kinds in a circuit, through which a current was made to pass by two Bunsen's cells, and noting their changes. The plates of the condensers were of tin-foil and had an area of about fifteen square inches. The experiments were as follows:

(1.) The dielectric used was a sheet of dry glazed paper. The condenser could not be charged so as to give a perceptible discharge.

(2.) When a sheet of glazed paper, moistened with shellac, was substituted for the dry paper, the discharge was sufficient to send the light off the scale of the galvanometer, and continued for some minutes.

(3.) Dry goldbeaters' skin was used as a dielectric, and no deflection could be obtained.

(4.) The goldbeaters' skin, when moistened with shellac, gave a slowly diminishing deflection.

(5.) The dielectric was made by flowing the surfaces of the plates with a solution of wax and gasoline, and a slowly diminishing deflection was obtained.

(6.) The condenser used in (4) was tried again after the shellac had dried and again gave a diminished deflection less than the first deflection.

(7.) The condenser used in (5), when tried again after a day or two, did not again give a deflection.

(8.) Unglazed paper dry and oiled gave no deflection.

(9.) Glazed paper oiled gave a very slight deflection, and the galvanometer needle immediately returned to zero.

(10.) Glazed paper wet with water and covered with shellac gave the greatest deflection of all the dielectrics. The light was sent completely off the scale and was only brought back by shunting the galvanometer. The discharge also continued a long time.

(11.) The conducting power of some of the various dielectrics was tested. The goldbeaters' which had been covered with shellac transmitted no current after it had been allowed to stand for a week. Freshly oiled and dry oiled paper did not conduct at all. Glazed paper covered with shellac gave a deflection nearly off the scale. Glazed paper wet with water and covered with shellac transmitted a current sufficient to send the light entirely off the scale.

What these experiments directly go to show are, first, that condensers with moist dielectrics received a greater charge than those made with dry, and

second, that the better the dielectric conducted, the greater the charge the condenser was capable of receiving. From these facts it would seem that the slow discharge of these condensers was very probably due to polarization. The best condensers, as shown by the experiments, possessed dielectrics which were moist and possessed considerable conductivity. The dielectrics when dry scarcely conduct at all. Their conduction when moist must therefore have been mainly due to electrolysis, since liquids conduct electricity only in very small quantities without being decomposed. The electrolyte was therefore decomposed, and the re-combination of the products of decomposition caused the return current. An exact analogy is thus determined between the case of the lead plates and these condensers. Whether it is an analogy that would hold in the case of all condensers which slowly discharge themselves, is an interesting question.

TELEGRAPH INSTRUMENTS ON TRAINS.

The Detroit *Free Press* says:

"Colonel Wheaton, Superintendent of the Kalamazoo Division of the Michigan Southern Railway, has provided the train men with a new telegraph instrument, by which connection can be made with the main line at any place and dispatches sent. The box is not large, but it affords room for train orders, stationery, one hundred feet of wire, etc. If a train breaks down, all that is necessary is to make connections with the main wire and orders can be sent or received at once."

SECULAR CHANGE OF THE MAGNETIC DECLINATION.*

By CHARLES A. SCHOTT.

This paper was entitled "Abstract of a Paper on a New Discussion of the Secular Change of the Magnetic Declination in the United States and Adjacent Countries in North America." The investigation is based upon a paper on the same subject in the Coast Survey report for 1839; incorporates all additional observations made or collected since that time, and includes observations at forty-three stations. The occasional reconstruction of the numerical expressions for the secular variation is necessary for providing the data as to the variation of the compass which is put upon the charts. The formulæ employed include the time or epoch counted from a certain fixed epoch, a constant representing the mean declination and other constants expressed in the forms of circular functions, which are deduced from observations at the same and at different places. The proper weights are given to observations depending upon their relative accuracy.

The list of places at which observations were made commences with Halifax and ends with Sitka and Unalaska, thus embracing a wide extent east and west. A table was given showing the close agreement between the computed and the observed declinations at Philadelphia from 1701 to 1872. Six diagrams also showed the relations between the computed and observed deflections, and the fact that at each place the needle attained its greatest easterly digression at different times, but by a progress through curves quite similar in character. The reading of the paper was followed by a short discussion by Profs. Wolcott, Gibbs, Lesley and Henry, during which the necessity of a careful examination of old surveys was insisted on as a means of increasing the information upon which similar investigations must be based.

*Abstract of a paper read before the American Academy of Science.

CORRESPONDENCE.

To the Editor of the Journal of the Telegraph:

In the JOURNAL for Nov. 1st appears a communication from "A Subscriber," in which he seeks information as to how to arrange a relay to work on the same circuit with a sounder. Your answer would require him to use more battery than he would be likely to have on hand, so I suggest he try the following devices:

If he will connect his circuit up in the ordinary manner, and then connect his two relay main line binding posts together, with a wire of about one-tenth the resistance of his relay, the resistance of the circuit will be greatly diminished, and, of course, will require much less battery to work it. And enough of the current will flow through the relay coils to work the relay. If the proportion between the relay and the shunt-wire I have mentioned does not work well, let him vary the resistance of the shunt-wire until he gets good results.

The second plan is one which I have used several times in such cases, and which I communicated to the JOURNAL in February last. Untwist the wires which connect the two helices of the relay, and connect the outside wire of each helix to the inside wire of the other, after the manner of reins for a pair of horses, and run a wire from each joint to one of the binding posts, and then connect the circuit up in the ordinary manner. The resistance of the relay will now be one-fourth what it was originally, supposing the two paths to be equal in resistance. The relay connected in this way will work weaker than before, but it will answer very well on a short circuit.

M. A.

Hoboken, N. J., Nov. 5th, 1874.

Answer.—Either of the above plans will accomplish the object, but a still better way would be to exchange the relay for another sounder and work the two sounders in the circuit. When two or more helices are worked in a circuit as receiving instruments they should have a uniform resistance.

To the Editor of the Journal of the Telegraph:

In the columns of the JOURNAL of November 1st, in answer to the inquiry of "Inquirer," you say, "If the message is delivered by the battery boy during the time for which he receives compensation from the Company, the amount collected for delivery of the message clearly belongs to the Company, and should be returned by the Manager as extra receipts." Now, in our office there are two messengers, who attend to nothing but the delivery of messages, whatever. Now, my question is, does the same apply to the messengers as in the case of the battery boy, who are also receiving compensation from the Company?

ANOTHER INQUIRER.

Answer.—If the messengers are paid by the week or month, the special delivery charges belong to the Company; if, however, they are paid so much for each message delivered, the extra amount would belong to the messengers.

SENATOBIA, Miss., Oct. 26, 1874.

To the Editor of the Journal of the Telegraph:

If I receive a message for Como, Miss., which place has no telegraph office, and said message is marked "Mail at Senatobia," and checked 10, paid, without mentioning three cents for postage, am I compelled to pay three cents out of my pocket to mail dispatch? Please answer through JOURNAL. WINKOUT.

Answer.—You should pay the postage, and take credit for the amount in your account current as paid other lines.

GOOD WORK WELL DONE.

ALBANY, N. Y., Nov. 9th, 1874.

To the Editor of the Journal of the Telegraph:

A serious break occurred on the lines of the W. U. Co. in our city on Thursday, the 29th ult., the circumstances of which are as follows. Late in the afternoon of that day, a freight train while under rapid headway was thrown from the track, and, in its course, struck a forty-five foot pole carrying over 80 lines, completely demolishing it and burying the tangled and broken mass of two sections of wire beneath the debris of the wrecked train, presenting a sight that was enough to well nigh dishearten any lineman. The disaster destroyed every Western circuit, all of the Northern circuits, with the exception of a few on the opposite side of the river, besides a number of short wires and loops. Darkness coming on before the location and extent of the trouble was definitely known, all idea of repairing it before the following day was abandoned, and many anxious inquiries were received from different points as to the prospects for the morrow. In anticipation of making as quick work of it as possible in the morning, local repairers were summoned from all directions to report at Albany immediately. Some half dozen men reached our city by evening trains, among them Foreman George C. Thompson, who, after making a survey of the wreck, decided that operations must be commenced at once, and not delayed until morning. By 11 o'clock these determined men were at work in good earnest, and by the light of a full moon they labored incessantly until 7 o'clock the following morning, when the last connection was made, and at the usual hour of testing, everything was O. K. and in readiness for business. In restoring the connections it was necessary to use three coils of new wire, which had to be carried by the men a distance of two miles. A great deal of praise is due to Mr. Thompson and his men for the energy displayed in remedying this serious difficulty. As a piece of repairing done entirely in the night time, we think it cannot be beaten.

X. Y. Z.

To the Editor of the Journal of the Telegraph:

Please inform us through the JOURNAL regarding the following: If a period occurs in the body of a message, is it proper to send and check the same as one word?

OPERATOR.

Answer.—The period should be transmitted, but not charged for.

TELEGRAPH MATTERS IN CENTRAL AND SOUTH AMERICA.

[From our Special Correspondent.]

ASPENWALL, Oct. 25, 1874.

The State of Magdalena has granted a contract to Señores Abello Hermanos to construct a land telegraph between Santa Martha and Barranquilla. Other lines, in different parts of Columbia, are in course of construction. The lines in Guatemala and Salvador continue to work satisfactorily and with profit. With an increase of telegraph receipts, a slight decrease in Post-Office receipts are noticed.

Peruvian dates are to Oct. 6th.

The press is chiefly taken up with commenting on the unsatisfactory working of the telegraph lines in the Republic. For some time back the line south of Callao has been totally interrupted, and that to Payta is only available at intervals. The Director of the line is Señor Paz Soldan, who is very much blamed, and considered also to have been the cause why the contracts made by the Peruvian Government for a cable from Payta to Panama fell through. The Colon and Jamaica cable continues working in a satisfactory manner.

ANGLO-AMERICAN TELEGRAPH.

The half-yearly general meeting was held on Friday, Oct. 16th, the Right. Hon. Viscount Monck in the chair.

The Chairman said that it would be remembered that on the last occasion of meeting in that room a strong expression of opinion was made that more frequent communication than yearly meetings should take place between the Directors and shareholders. In conformity with that resolution, they were there that day to meet them, and render an account of their stewardship for the last six months, and to refer to the various circumstances which had occurred that had affected the interests of the Company. On that occasion a certain amount of depression was felt amongst the shareholders, who were threatened with a "light" cable, and with the heavy guns of the Direct United States Cable which were brought to bear upon them. But, if they would forgive the expression, the "light" cable, with all its buoyancy, would not float, and had gone down, and was not likely to rise again. He would only say of the other enterprise, that he had had now some experience in laying Atlantic cables, and if at that moment he were in the position of directing (as their Chairman) the Great Eastern to lay a cable at the present time, he should be affected by a feeling for which "uneasiness" would be a very mild term. At the last meeting the Directors stated the policy which they meant to pursue with regard to the large amount of the resources which they then had in their hands. They told the shareholders that the best application of such resources would be to consolidate the working stock by expending it in laying a further cable across the Atlantic; at the same time telling them, as far as they could calculate, they should be able to achieve that object without any increase in stock, or without calling upon the shareholders to put their hands in their pockets. He had the extreme happiness to tell them and congratulate them upon the fact that the cable had been made, successfully laid, and that a certificate from their electrician stated that the cable was in as good condition as it was possible for it to be; and, in addition, that it was fully paid for. He could not leave that portion of the subject without expressing, as he was sure would be the expression of every one connected with that Company, their admiration of the manner in which that operation was conducted. It really appeared when one took up the paper every morning while the laying was going on, and saw the daily announcements of progress, as if it were the result of clockwork, and also that such a work was of the most simple and easily accomplished description; but there were a great many things which could be easily accomplished by persons of skill; but when people not endowed with it tried to effect the same operations, they generally found that appearances were very deceptive. The facility with which Captain Halpin had accomplished his task had induced people to think that was a very simple operation; but he thought they were beginning to think that they were mistaken—that it was not so easy. There was another matter which had made a considerable drain on the financial resources of the Company, which they were obliged to meet, and which they had met, out of the revenue, and that was the provision of a maintenance-ship on the other side of the Atlantic. After the loss of the Robert Lowe, off the coast of Newfoundland, the Directors felt compelled to provide a vessel in its place, and that which had occurred during the last six or seven weeks would, he thought, show their wisdom in so doing. He (the Chairman) was in Ireland when he received from the Manager

the information that, in consequence of the storms, telegraphic communication between the Old World and the New had been completely stopped. But, owing to the provision of a maintenance-ship which they had made, they had been able to restore that communication within twenty-four hours. He therefore thought that they would admit that such an application of their revenue was a wise one. Another matter was that their communication with the States, except by the St. Pierre and Duxbury line, was through a portion of the Dominion of Canada. It was quite true that they had not obtained from the Government of Canada any legal permission to land their cables there; but he happened to be in an official position in Canada during the laying of the 1866 cable, and he could well recollect the enormous enthusiasm by which the cable was welcomed in Canada; and one would have imagined that the Company had conferred upon them one of the greatest blessings—as it had. By some means influential members of the Canadian Parliament were induced to bring forward a bill the effect of which would be absolute confiscation of their property. This bill was carried through the different houses and was read a second time before the Directors had any information of its existence. The bill was reserved for Her Majesty's assent, and the Directors then took the opportunity of making a strong representation of the facts to the Colonial Office here. From that representation they had received no reply, it being usual, if the Colonial Secretary meant to take exception to the bill, for him to take no action whatever; but they anticipated having a definite answer by the next meeting. These were the principal occurrences which had taken place since he last had the honor of addressing them. Another question which affected them was the chance of the termination of their monopoly in Newfoundland, or the purchase of their interest by that Government. He had no information to the effect that they meant to move. The only other subject to which he need allude was the state of their finances. From what he had said they would have seen that the drain upon their revenue was of an exceptional and abnormal character. The money had been laid out for a purpose which could not fail to bring the shareholders some considerable increase of revenue in the future. He thought that, after the long period which the present Board and the shareholders had been together, he was not asking them too much when he requested their confidence still, and the Board would undertake that things should go right, as they had been going, and that the shareholders should have, at the end of the year, the knowledge that their affairs had been thoroughly well managed, and that by their addition to the working stock they would be able to do the work of the public with increased efficiency, and he trusted to give them increased dividends. He should state to them that the cable of the "Direct" Company had been buoyed off Newfoundland on what they believed to be a portion of their monopoly; they had accordingly applied for an injunction to prevent the landing of the cable, which had been granted.

BRAZILIAN SUBMARINE TELEGRAPH.

The ordinary general meeting of the Company was held on Wednesday, Oct. 14th, Viscount Monck in the chair.

The report stated that the share capital had been fully paid up, with the exception of £395, which was in course of liquidation. The Directors, on the 10th of November last, were compelled to announce the postponement of the opening of the Lisbon-Madeira section. The efforts of the contractors to

up and repair a fault in the cable having, in consequence of continuous bad weather and loss of grapnel rope, ended in its breakage. On the 18th of March the Madeira-St. Vincent section of 1,260 miles was successfully completed and opened for traffic. On the 17th of June the Lisbon-Madeira line was recovered from the depth of over 2,400 fathoms and repaired. On the 23d of June the last section between St. Vincent and Pernambuco, consisting of 1,953 miles, was laid, and the telegraphic communication established between Europe and Brazil. The cables were in satisfactory working order. The Directors took this opportunity of acknowledging the valuable assistance rendered by the Governments of Portugal and Brazil during the laying of the cable, and the support they continued to give to the enterprise. Working arrangements have been concluded with the Eastern Telegraph Company, the Western and Brazilian Company, and the West India and Panama Company, by which the continent of South America was placed in direct communication with India, China, Australia, and the United States. From the opening of the line on the 23d of June to the 25th of September, notwithstanding interruptions on the lines south of Pernambuco, the total receipts amounted to £24,471, showing a profit at the rate of nearly 6 per cent. per annum. The expenditure on capital account amounted to £1,296,888.

WEST INDIA AND PANAMA TELEGRAPH.

The report of the Directors for the nine months ending the 30th June shows that the amount accruing on revenue account is £20,888, and that the expenses have been £20,072, leaving a balance of £815, which has been placed to reserve account, as per balance sheet. Interruptions in sections of the Company's cables, and the failure of the Cuba Company's cable between Santiago and Batabano for a period of over six months, deprived this Company of over two-thirds of the period under report of all through telegraphic communication with Europe and America, and the financial result of the nine months' working affords, therefore, no criterion of the value of the Company's system. The above interruptions of this Company's lines were, as mentioned in the last report, remedied in January and February respectively by the Telegraph Construction Company, and the Cuba Company's cable resumed working early in April. Information has been received of the interruption, on the 16th September last, of the International Ocean Telegraph Company's cable between Florida and Key West, and that a vessel has been sent to the spot to effect the necessary repairs. Messages in the meantime are conveyed over the interrupted section by special steamer. To avert as far as possible the heavy losses of revenue occasioned by the frequent interruptions, the shareholders have approved the recommendation of the Board to duplicate portions of the lines of this Company; the Cuba Company, affected by similar losses, have arranged to duplicate their system between Cienfuegos and Santiago; and the Directors have much pleasure in reporting that the International Ocean Company have informed this Company by wire of their intention to place two cables in thorough working order between Florida and Key West. By means of the authorized Para-Demerara line the whole of the West India telegraph system will also possess an alternative route to Europe and America, and the Board therefore hope by the end of this year to see this Company's property placed in a condition under which it may be expected to continue constantly at

ments have been made with the Cuba Company to divert the course of their intended duplicate cable between Cienfuegos and Santiago, and to lay it from Cienfuegos to Holland Bay, Jamaica, thus giving an alternative line for the transmission of traffic in case of the interruption of the cable from Jamaica to Santiago, or of that from Santiago to Cienfuegos. As an inducement to the Cuba Company to consent to this alteration, and in view of the benefit to be derived by this Company from it, the Board has agreed to pay for the extra length of cable required to land at Jamaica; the cable to remain the property of the Cuba Company, who undertake to keep it in repair. With the object of connecting the proposed duplicate line from Trinidad to St. Croix and Ponce with the original system of the Company at an intermediate point, and in order to obviate the necessity and expense of using for this purpose the Porto Rico Government land line between Ponce and St. Juan, which, from its being constantly occupied with Government work, is a frequent cause of delay, the Directors have contracted with Hooper's Telegraph Works to lay a cable from St. Thomas to St. Croix for a sum of £28,800 in fully paid-up ordinary shares of the Company. This cable will be sent out with the expedition to lay the line from Trinidad to St. Croix and Ponce. The Directors, by circular of 24th July last, informed the shareholders of the failure to complete the section of cable from Para to Demerara. Upon the return of the expedition to England the cable was examined by the engineers, and the Board, acting on the advice of Sir William Thomson, have arranged that a length of 309 knots of new cable be made in substitution for an equal length of that brought home in the screw-steamer Hooper; and, in consideration of a diminution in the size of the core of the substituted cable, a reduction of £15,000 in the contract price was agreed to. The cable, to complete the section from Para to Demerara, is expected to be sent out in November, delay having occurred by the return of the former expedition and the manufacture of the new cable. The section to be laid between Trinidad and St. Croix and Ponce is to be dispatched about the end of November. The Board, immediately on taking office, addressed itself to improving the working of the Company's lines and to developing the traffic. The result has shown itself in the increased efficiency of the service, and in the greatly improved speed and correctness in transmission of messages. The Directors are endeavoring to effect satisfactory arrangements with the various Colonial Governments in reference to the subsidies with as little delay as possible. Active steps are being taken by the Board for the settlement of the differences relating to the steamship Suffolk. The time for closing of the evidence in the suit in Chancery against the India Rubber Company has been extended, at the instance of the defendants, to the 2d of November next, but, as the cause has been set down for hearing, delay has not been thereby occasioned.

THE total number of messages forwarded from postal telegraph stations in the United Kingdom during the week ended the 10th of October, 1874, and during the corresponding week of 1873, was: October 10, 1874, 898,978; October 11, 1873, 372,884; increase, 21,094.

THE total number of messages forwarded from postal telegraph stations in the United Kingdom during the week ended the 17th of October, 1874, and during the corresponding week of 1873, was: October 17, 1874, 406,067; October 18, 1873, 360,788:

TARIFF BUREAU.

SEMI-MONTHLY CIRCULAR.

EXECUTIVE OFFICE,
WESTERN UNION TELEGRAPH COMPANY,
145 Broadway, New York, November 15, 1874.

To all offices on W. U. Lines:

The following changes and additions have been made since the date of the last circular:

GENERAL INFORMATION.

Oxford, Ala., re-opened, square 266.
The "tariff for other lines" to Kingston, Cal., is 80 +10 from Visalia instead of Colusa, as given in JOURNAL of October 15, 1874.

Bluff Springs, Fla., closed.

Hereafter the "tariff for other lines" to Milton, Fla., will be 50 5 from Pensacola, instead of 100 10 from Pollard, Ala., as heretofore.

Crawfordsville, Ga., closed.

Blackshear, Ga., closed.

Thomson, Ga., re-opened, square 196.

Sugar Valley, Ga., closed.

On and after Nov. 23, Washington Heights, Cook Co., Ill., will be in square 307 instead of 288.

Allens, Ind., closed.

Jefferson, La., closed.

Sassafras Island, La., closed.

Bar Harbor, Me., closed.

Relay House, Md., changed to Relay Station.

South Dedham, Mass., changed to Norwood; business checked direct (the latter is in the tariff book).

Carter's Hill, Miss., closed.

Norwood, N. J., closed.

Lake View, Chautauqua Co., N. Y., closed.

Messages addressed to Springport, Cayuga Co., N. Y., should be sent and checked to Union Springs, N. Y.

Staffordville, Ont., should read Straffordville.

Campbell's, Ont., changed to Garden Hill.

Linwood, Pa., re-opened.

Salisbury, Pa., closed.

Hereafter 25 cents for delivery should be collected on all messages sent to Beech Creek, Pa. The town is one and a half miles from the office, which is at the depot.

In JOURNAL of Oct. 1, 1874, St. Paul's Bay, Que., should read Ont.

Red River City, Texas, closed.

Stockton, Utah, closed.

Newfoundland messages should, in all respects, be counted in the same manner as Atlantic Cable messages.

NEW OFFICES.

* Ferry Pass, Fla., 50 5 Pensacola.

228 Cairo, Ga.

307 Hyde Park, Ill. (branch of Chicago), tariff same as, and check Chicago.

386 Brainard, Iowa.

426 Commerce, Iowa.

* Keosauqua, Iowa, 15 1 377 Summit, Van Buren Co.

518 Halsted, Ks.

453 Lyons Point, La.

85 Relay Sta., Md. (formerly Relay House), P. O. A. St. Dennis.

118 Benzonia, Mich.

100 Elk Rapids, Mich.

200 Marysville, Mich.

187 Orient, Mich.

* Lodi, Nev., 80 +10 Palisade.

242 Monroe Sta., Butler Co., Ohio.

* Belmore, Ont.

* Chesley, Ont.

* Dungannon, Ont.

* Garden Hill " (formerly Campbell's).

* Glen William "

140 St. Joe, Butler Co., Pa.

59 Perkaskie, Pa., check Sellersville.

* Hadlow, Que.

* Isle Verte Sta., Que.

* St. Fabien, Que.

† For each additional five or fraction of five words.

NOTICE TO OFFICES IN SQUARE 456.

The tariff from square 456 to squares 427, 429 and 430 is 40, 50 and 75 cents respectively. Officers whose square sheets show a different rate will make the necessary correction.

ATLANTIC CABLE BUSINESS.

We are notified that the cables between Hong Kong and Saigon, and between Shanghai and Amoy, are now repaired. Direct communication by telegraph is again established to Hong Kong, Amoy and Shanghai.

TRANSFER SERVICE.

EXECUTIVE OFFICE,
NEW YORK, NOV. 14, 1874.

On and after December 1st, Mount Carmel, Pa., will be discontinued as a money order office.

GEO. H. MUMFORD,
Vice-President.

THE TELEGRAPHERS' MUTUAL BENEFIT ASSOCIATION.

ACKNOWLEDGMENT OF RECEIPTS FOR ASSESSMENTS UP TO AND INCLUDING NOV. 7, 1874.

ASSESSMENT NO. 69.

13, 52, 59, 61, 65, 67, 72, 80, 89, 90, 93, 121, 122, 129, 131, 134, 140, 215, 230, 235, 244, 247, 254, 257, 267, 278, 279, 280, 282, 283, 285, 351, 367, 380, 381, 406, 414, 416, 425, 426, 433, 526, 533, 543, 553, 554, 576, 577, 579, 587, 594, 600, 603, 678, 680, 703, 714, 715, 721, 735, 740, 791, 826, 830, 832, 876, 952, 978, 995, 998, 1001, 1023, 1055, 1074, 1076, 1081, 1086, 1090, 1093, 1144, 1143, 1167, 1173, 1182, 1200, 1243, 1259, 1260, 1267, 1292, 1329, 1364, 1365, 1368, 1394, 1425, 1431, 1453, 1470, 1492, 1532, 1560, 1564, 1560, 1601, 1615, 1619, 1625, 1626, 1630, 1632, 1634, 1636, 1632, 1636, 1723, 1809, 1811, 1813, 1817, 1831, 1869, 1874, 1911, 1913, 1914, 1965, 1999, 2000, 2001, 2023, 2029, 2036, 2038, 2048, 2057, 2062, 2113, 2122, 2194, 2195, 2199, 2203, 2204, 2205, 2206, 2213, 2216, 2223, 2234, 2232, 2232.

ASSESSMENT NO. 68.

22, 273, 294, 347, 431, 432, 527, 622, 725, 736, 898, 899, 906, 930, 1124, 1135, 1136, 1435, 1559, 1606, 1610, 1611, 1612, 1639, 1653, 1655, 1657, 1690, 1691, 1722, 1773, 1827, 1973, 1993, 2033, 2036, 2122, 2200, 2265.

MISCELLANEOUS.

67.—383.

66.—19, 1502.

Members of the Association who look to the JOURNAL OF THE TELEGRAPH for receipt of assessments paid, will please take notice, that an acknowledgment of the receipt of one assessment should be taken as a receipt for all previous assessments.

LEASE OF THE FRANKLIN TELEGRAPH LINE.

A meeting of the stockholders of the Franklin Telegraph Company was held in Boston on Friday, Nov. 6th. The proceedings were not wholly harmonious, but, on the contrary, considerable feeling was manifested at what is considered an unfair action on the part of certain persons connected with the Atlantic and Pacific Telegraph Company. That line, however, holding the majority of the stock, voted to lease the Franklin line to itself for \$25,000 a year.

It is understood that the action of the meeting will be carried to the Supreme Court by those opposed to the lease.

BORN.

WOLFINGTON.—At Tilden, Ill., Oct. 23, 1874, a daughter to J. W. Wolfington, Agent and Operator.

MARRIED.

ADAMS—DIRSTINE.—At the residence of the bride's mother, Alexander, N. Y., Oct. 6, 1874, by Rev. Dr. Hunt, Edgar G. T. Adams, for many years Manager Batavia, N. Y., Office of the W. U. Tel. Co., to Miss Ella A. Dirstine.

BEARD—LONG.—At the residence of the bride's parents, Brooklyn, N. Y., Oct. 29, 1874, by Rev. Dr. Duryea, James R. Beard of Philadelphia to Miss Della Long.

BROWN—BROWN.—At the residence of the bride's parents, Oct. 28, 1874, Charles Brown, Operator W. U. Tel. Co., Little Falls, N. Y., to Miss Mary Brown.

HOWDEN—REID.—At Louisiana, Mo., Nov. 5, 1874, by Rev. H. K. McComb, Wm. J. Howden, Manager W. U. Tel. Office, to Miss Linda Reid, all of Louisiana, Mo.

DIED.

WILDRICK.—At Freemansburg, Pa., Oct. 26, 1874, Irvin H., son of Frederick H. Wildrick, Agent and Operator, aged 5 months and 14 days.

RAILWAY SIGNALS.

At the meeting of the London Association of Foremen Engineers and Draughtsmen, presided over by Mr. J. Newton, C. E. (late of the Royal Mint), Sir David Salomons, in a discussion which followed his reading of a paper on "The Electric Telegraph," referred to railway signals, as also did Mr. W. Smith, C. E., and others. Mr. Smith said that he had applied an arrangement of the siphon pen for the purpose of recording the movements of railway points, signals, and levers, so that their movements might be marked on a piece of paper. On the same piece of paper could also be recorded by his apparatus the number of passengers in a train and when it passed a station. Upon a piece of paper eight or nine inches wide could be recorded the whole history of what had been done in the signal-box of such a place as Charing-cross Station from six in the morning until six at night. From the paper could be ascertained how many times the man in charge had attempted to move the points, signals, or levers, whether he had tried to move the wrong ones, and when the signal levers had been acted upon either by moving the distant signal or the home semaphores, so that the whole performance of the signalman in his box was recorded on the sheet of paper. A great many accidents had resulted from an improper moving over points. Sometimes a man discovered what would happen just as a train was about to enter the points, and in attempting to turn it over an accident resulted. In nearly all cases where accidents occurred from running over the line both the engine-driver and his mate stated on their oath before the Government Inspector that they saw the signals at "all right," and that they went on believing the signals represented the condition of the line, while the signalman would swear that the signal was "at danger." In such cases there was always very conflicting evidence; it was with a view of settling beyond dispute such matters that he had taken them into consideration, and he was pleased to say that his efforts with the siphon pen had resulted very successfully. Sir David Salomons considered Mr. Smith's idea very ingenious, but he himself hoped soon to bring before the public a means of dispensing with signals altogether on railways. With respect to the conflict of evidence as to the signals, the colors employed—red and green—being complementary, caused mistakes. He thought other colors might be used.

A SIMPLE METHOD OF GENERATING ELECTRICITY.

The Armstrong electrical machine in general use is expensive, and from the fact that it produces negative electricity only leads to confusion of ideas when used for lecture room illustrations. Prof. Rugers explained a simple and inexpensive device of his own for generating positive electricity which can be employed wherever there is a steam boiler in a building. He attached a pipe to an ordinary boiler used for heating purposes, and carried it through the window to the outer air. To the end of the pipe where the steam escaped he attached what are known as Faraday's nozzles—15 of them—with applewood apertures. In front of these nozzles he suspended by a brass rod a piece of brass foil, cut so as to present a bristle of points to the escaping steam. He had only to provide an insulating support for the rod and carry a wire through a pane in the window to a long rod held by ribbon silk in the room where he desired to use the electricity to have a strong positive current. A tube inserted in the steam pipe with a valve opening inward admitted air sufficient to produce a uniform condensation of the steam.

WARNER'S NEW RELAY.

BY F. W. JONES.

A new form of relay, the invention of Mr. E. P. Warner, of the Western Electric Manufacturing Co., Chicago, has lately put in an appearance, and some of its features are novel enough to deserve notice. The objects sought to be gained in this relay are the reduction of the coercitive force of the iron cores to a minimum, the exemption from the retractible force of springs acting in opposition to the force of the magnets, the abolition of an unpolarized armature, and the utilization of the attractive and repulsive force of a permanent magnet upon the tongue operating the local circuit. The present construction of the instrument is something after this fashion: On an ordinary relay base are placed, horizontally and laterally, two helices, supported in such a way that one helix lies near the base and the other a distance therefrom equal to its own diameter, but in close proximity to the lower helix. The core of the upper helix is *fixed* and ends immediately outside its convolutions, but has extensions to the left at right angles to the core. The lower helix has a core arranged to move laterally on pivots, and to its ends are fixed extensions at right angles, and passing upwards directly in front of the faces of the upper core extensions, and ending directly above them.

A light brass yoke resting upon the ends of the extensions of the lower core has a small vertical tongue extending upwards and set between a pair of stops set by screws, which make and break the local circuit as in an ordinary relay. On the left of the lower core extensions is placed horizontally a permanent horseshoe magnet of the best tempered steel, its poles approaching the lower core extensions directly in a line with those of the upper helix on the opposite side. This permanent magnet can be moved towards or from the the lower cores at pleasure. When there is no current through the electro-magnets, the permanent magnets will induce opposite polarity in the movable soft iron core, and attract it, retaining the tongue on the back or open stop. Let the line current be sent through the coils. The extensions become *oppositely* polarized in respect to themselves, the moveable extensions being polarized similar to the permanent magnet. This produces attraction between the two cores and repulsion between the permanent magnet and the movable core in proportion to their respective forces. Should any current be flowing out to *escape*, the tendency the cores may have to move towards each other is overcome by placing the permanent magnet nearer, when the poles of the latter induces in the movable core a stronger polarity than the current excites, and so retains the tongue upon the back stop until it is overcome by the signaling current. Unlike a spring, the force the permanent magnet exerts is nearly in proportion to the square of its distance, consequently greater margin is obtained with less adjusting.

It is well known that soft iron armatures retain the polarity impressed upon them by the electro-magnets for a short time after the current ceases, also that the longer the electro-magnet the greater its retaining power and consequent sluggishness. In the Warner relay, these disadvantages are overcome by having magnets but one-half the length of the shortest used in the best style of horseshoe relays. This insures the quick discharge of each core, and reduces its retaining power to the lowest point, especially as the purest iron is used.

No armature has to be magnetized by induction

from the poles of an electro-magnet. The cores are simultaneously magnetized by the same current, and their extensions have sufficient metal section to reduce their *magnetic resistance* to a very low point, and, at the same time, the weight of the movable core, its extensions and tongue, does not exceed, to any great extent, the weight of an ordinary armature tongue and axis.

Of course it is requisite that the current should flow always through the coils in one direction, and to this end there is fixed on the base a little switch which only needs one move to right or left to reverse the coils in circuit. When the best magnetic effect is gained, it is certain the switch is on the proper side. After once being put correctly in circuit there are but few instances where reversing would be necessary. In addition to the magnets not being required to polarize and move an inert iron mass held back by a spring, they are assisted by the repulsive force of the permanent magnet just at the right time giving firmness to the local contact, celerity to the motion of the tongue and reliability of action. The relay has been severely tested in circuits of all conditions and performed admirably. Unlike many other relays the permanent magnet stands separate and apart from convolutions and reversing coils of every kind, and will not undergo that deterioration which is experienced in other combinations. The nearest approach to this of any relay is that of Mr. Varley, described as follows: "Varley's relay consists of a soft iron bar fixed so as to move horizontally within a hollow cylindrical coil. It is polarized by horseshoe magnets at each end between the poles of which the bar plays. One of the magnets is movable, and serves to adjust the relay by attracting the bar. A thin flexible spring is fixed to the end of the bar, projecting about an inch beyond it. There are two sets of screw stops, one touching the end of the bar, the other the end of the spring, so adjusted as to make contact with the outer screw before the motion of the bar stops on the inner one, thus giving a double contact for weak currents."

The main features of the two instruments are totally unlike and their functions as widely apart. In the Varley relay the movable core acts horizontally between *two* permanent magnets on double points.

The Warner relay gives a lateral motion to its movable core which seeks to complete the magnetic circle, (of which it forms half,) in obedience to the direct polarizing influence of the signaling current, receiving the repelling assistance of the permanent magnet used in conjunction. It is not strictly a self-adjusting relay, else it would be subject to all the false signals from other wires.

The appearance of the instrument is very fine, having a more solid and finished appearance than the spring relays. One of the Warner relays, 150 ohms, was worked on a straight wire, between Chicago and New York, with no intermediate battery, and recorded fairly the signals, which were very light and unsteady, on a 600 ohm testing relay of usual make.

Remarks.—The relay above described has been tried on several of the circuits from the New York office, and found to work quite satisfactorily. The result of a comparative test, however, does not indicate any superiority over the regular form of relay now in use.

THE best of men have doubted their powers of judgment between right and wrong.

WERE it not for the clouds that darken us there would be no rainbow in our lives.

ELECTRIC HEAD LIGHT FOR LOCOMOTIVES.

A new method of illuminating railways was tried for the first time in Russia on the Moscow and Kursk Railway on the occasion of the Emperor's recent journey over that line, and the experiment proved to be a perfect success. The apparatus consists of a battery, composed of forty-eight elements, which, when fixed on the locomotive, lights up the railway for a distance of 500 yards with electric light. It is the invention of Herr P. N. Jablotschkoff, the head of the telegraph department of the above-named railway. On the occasion alluded to he conducted the experiment in person, and the Czar was pleased to express his full-approbation of the invention as one calculated to prevent accidents by collision in the dark.

PASSIVITY OF IRON.—*P. de Regnon.*—The author made use of iron wires protected, for a certain length, by glass tubes or layers of varnish. The free extremity, for the length of 2 to 3 centimetres, could be entirely plunged into the acid. An electric current entering by the iron into any nitric acid soever, renders it passive as long as the current lasts, with liberation of oxygen almost pure. On breaking the current the iron remains passive. A current taking its exit by the iron destroys the passivity—a change of condition which may be repeated indefinitely. Iron acting as positive electrode in a mixture of sulphuric acid and water liberates oxygen, is slightly attacked, and is rendered passive for nitric acid. A reversal of the current destroys the passivity. The action of nitric acid upon iron may be stopped by touching it, or better by rubbing it within the acid with a conducting body not attacked by the acid, such as platinum or charcoal. This action of carbon explains why steel and cast iron become spontaneously passive. The more concentrated the acid, the more readily passivity is produced. The contact of an attackable metal destroys passivity. If, therefore, we bring in contact two iron wires, the one passive and the other active, the result may be either the passivity or the attack of both. The end of a wire may be washed in water without destroying its passivity, provided care is taken not to immerse the wire beyond the protecting varnish. The wire may even be scraped under water with another passive wire, or with the end of a clean glass tube, without altering its condition. This experiment completely overturns the explanation of passivity by the assumed formation of an insoluble layer on the surface of the wire. Oxidizing agents are without action upon passive wire, but deoxidizing bodies destroy the passivity. Most causes which produce passivity may be reduced to a voltaic force carrying the oxygen to the iron, and polarizing it upon the surface of the metal. On the other hand, the majority of the causes which destroy the passivity of iron may be reduced either to a voltaic force in the opposite direction, or to a current due to the polarization of the oxygen, and by which it is exhausted; or, lastly, to an absorption of the polarized gas by a body greedy of oxygen. We can now understand two experimental precautions insisted on above. It is necessary to protect the portion of the wire not plunged into the acid by an impenetrable coating, otherwise the acid vapors would place this portion in a state opposed to the passivity of the immersed portion. Again, when washing the passive extremity in water; if the metal is immersed beyond the varnish we close a circuit, by which the polarization is exhausted, and the passivity destroyed.

Journal of the Telegraph.

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JOURNAL OF THE TELEGRAPH,

Western Union Telegraph Company,

145 Broadway, New York.

NEW YORK, NOVEMBER 16, 1874.

MORE TROUBLE WITH THE DIRECT CABLE.

THERE seems to be fatality attending the laying of the Direct United States Cable. At the first attempt it parted when about six hundred miles had been paid out, and after vainly endeavoring for a week to recover it, the *Faraday* and her consorts returned to England. After refitting, the expedition returned to the point where the cable was lost, and recovered it at a depth of 1,871 fathoms. It was found to be in good condition, and was spliced to the portion remaining on the *Faraday*, and the work of paying out was resumed on the 2d inst. On the 8th, when within two hundred miles of the American coast, a fault was discovered, but too late to prevent it from passing overboard. The wind was blowing a gale at the time, and the last word from the ship was that they were about to buoy the cable. At this writing, six days after, nothing has been heard from the *Faraday*. It is probable that another mishap has occurred.

WE have received a number of solutions of the electrical problem which appeared in the JOURNAL of January 1st, and which was reproduced in the issue of October 15. Many of them are incorrect. Those which are correct we shall shortly publish with the formula in which the problem is worked out.

EMPLOYEES of the Western Union Company should bear in mind that they can be supplied with the JOURNAL at the old rate of subscription, one dollar per year. This opportunity for obtaining information and instruction so valuable to the telegraphist should not be neglected.

AN ITEM FOR CONSIDERATION.

The honest advocate for Government Telegraphs in this country will do well to consider the statement of the German Minister of Finance, recently made to the Reichstag. With a surplus in the Treasury, derived from other sources, of 18,880,000 reichsmarks, equal to \$8,880,000, the Government will have to ask for loans to meet increased expenditures, partly on telegraph account.

If, in a community of intense business activity in the heart of Europe, with a population about that of the United States, compressed into a territory one twenty-third its size, with contiguous populations aggregating three hundred millions in intimate business relations, there is a large deficiency on telegraph account every year, to be made up by loans or taxes, what would be the prospect for us who have none of these advantages?

The net loss in operating the German telegraphs in 1873, of which we have official reports, was \$661,727.

ANOTHER PIONEER GONE.

A dispatch from Omaha, Nebraska, announces the death in that city, by apoplexy, on Nov. 7th, of Edward Creighton, one of the earliest pioneers of the telegraph. Twenty years ago Mr. Creighton was one of the most prominent men in the profession, being from 1852 to 1859 the general agent of the lines then organized as the Western Union Telegraph Company, but which, however, had not then arrived at the strength and power since attained.

Mr. Creighton's first connection with telegraphic enterprises was in 1847, when he supplied the poles between Springfield and Cincinnati for the Pittsburgh, Cincinnati and Louisville telegraph line. From that time to 1852 he was engaged in the construction of various telegraph lines, principally in the West and Southwest.

In 1859-60 he examined the different routes proposed for the line to the Pacific Coast, and finally reported in favor of the route from Omaha to California via Salt Lake, which, on his report, and his expressing his willingness to undertake its construction, was adopted. The energy with which this great work was pushed through, under Mr. Creighton's personal superintendence, is shown from the fact that it was commenced July 4, 1861, and communication established October 24th of the same year. Of this line the 700 miles west of Omaha, via Julesburg, was constructed by the party under Mr. Creighton, connecting with another party under Mr. Stebbins, who built 400 miles of the line from Salt Lake east. After the California line was built Mr. Creighton was appointed Superintendent of the lines west of Chicago, until February 1, 1867, when, on their being consolidated with the Western Union Telegraph Company, he resigned. He continued to be engaged in the construction of telegraphs west of Omaha until 1869.

From his telegraphic and other enterprises Mr. Creighton acquired a large fortune. Personally he

was a genial, kind-hearted man, of strong will and stern integrity.

At the time of his death he was in his fifty-fifth year. His portrait and biography in detail appeared in the JOURNAL of June 1st, 1870.

ANNUAL MEETING OF THE TELEGRAPHERS' MUTUAL BENEFIT ASSOCIATION.

The annual meeting of the Telegraphers' Mutual Benefit Association was held, according to notice, on the evening of the 11th instant, at 145 Broadway, New York. Various delegates from a distance were present, among whom were A. Wilson, Jr., of Baltimore, J. W. Tillinghast and N. Hucker of Buffalo, F. W. Jones of Chicago, W. J. Denver of Springfield, Mass., John Fuller of Easton, Pa., H. A. Clute of Harrisburg, Pa., besides others whose names we do not recall, and a very fair representation of city members. The meeting was organized by the election of R. H. Rochester, Esq., as Chairman, and William Holmes, as Secretary.

REPORT OF THE OFFICERS.

During the year ending November 1 the number of deaths has reached 18, and have occurred in 10 different States, as follows:

Alabama.....	2	Ohio.....	1
Massachusetts.....	1	Illinois.....	1
New York.....	5	Michigan.....	1
Pennsylvania.....	1	Louisiana.....	3
Kentucky.....	2	Kansas.....	1

Assessments for the two last deaths have not yet been issued, but are included above.

The five deaths which have occurred in New York were, with one exception, of those who came into the Association during the first two years of its existence. This is true also of those which occurred in Alabama and Pennsylvania. No death has occurred among those received into membership during the past year, with the exception of Mr. McDill of Kansas, who was accidentally killed.

Accompanying this report will be found a list of all deaths since the organization of the Association, with the dates, causes and places, for the information of all parties. These deaths occurred in the different States, as follows:

Alabama.....	4	Minnesota.....	1
Arkansas.....	2	Maryland.....	1
Connecticut.....	1	Missouri.....	1
Georgia.....	2	New Jersey.....	1
Illinois.....	3	New York.....	23
Indiana.....	2	Nova Scotia.....	1
Iowa.....	1	Ohio.....	7
Kentucky.....	2	Pennsylvania.....	9
Kansas.....	1	Tennessee.....	6
Louisiana.....	5	Virginia.....	1
Massachusetts.....	1	W. Virginia.....	1
Michigan.....	3		

CAUSES OF DEATH.

28 died of consumption.
9 died of fevers.
5 died by accident.
4 died of heart disease.
3 died of pneumonia.
3 died of congestion of brain.
20 died of various other causes.

Of the 23 deaths in New York, 8 were residents of the City of New York, and 7 of these were members in the first year of the existence of the Association. The average membership of all who have died is 2 years and 4½ months.

The number of members at the time of your last annual meeting was.....	1,330
New members since that time.....	189
	1,418
Certificates canceled during the year.....	212
	1,206
Present membership.....	1,206

It may seem to some discouraging, thus to report a decrease in the membership. We cannot so regard it. The year has been one of great trial. Many members have dropped out simply because they could not obtain their small incomes from the companies by which they were employed. Others needed their whole income to help to mitigate the disasters of others whose needs seemed to demand their first care and provision.

And when five members died within a few days of each other, very few indeed felt certain that they could retain their membership were these harvests of death to repeat themselves with a sweep so often and so wide. That we stand to-day with almost unbroken ranks, and with so slight a decrease is a subject for congratulation. It should be remembered also, that under existing conditions, delinquency, even for imperative causes and for a very brief period, almost necessarily closes the gates against restoration, and practically excludes hundreds, once members, as devoted and worthy as ourselves.

The condition of the finances is as follows:

Balance, November 5th.....	\$8,435 15
Received for Assessments.....	22,898 30
Received for Applications.....	297 50
Fines for Readmission.....	72 00
Gift A. D. Cunningham of Texas.....	1 00
Interest to July 1st, 1874.....	461 24

\$32,100 19

Paid to heirs of	Assessment.	Amount.
Th. Wilcox.....	44	\$1,229 00
E. Wade.....	45	1,217 00
R. S. Fowler.....	46	1,220 00
W. P. Tuites.....	47	954 00
John A. Conley.....	48	1,178 00
M. H. Bacon.....	49	1,135 00
E. S. Keep.....	50	1,130 00
A. Saville.....	51	1,115 00
C. W. Hills.....	52	1,112 00
C. McCarthy.....	53	1,018 00
J. M. Worden.....	54	1,000 00
F. E. Curtis.....	55	1,000 00
G. M. Simmons.....	56	1,000 00
W. H. Kelly.....	57	1,000 00
C. P. Rasser.....	58	1,000 00
S. Porter.....	59	1,000 00
G. H. Everett.....	60	1,000 00
E. P. Reardon.....	61	1,000 00
M. C. Hart.....	62	1,000 00
T. W. Priest.....	64	1,000 00
T. A. English.....	R. fund.	150 00
R. B. Dillon.....	65	150 00
C. B. Mathews.....	66	150 00
V. A. Shea.....	68	100 00
Printing.....		215 15
Postage.....		178 81
Refunded.....		28 00
Expenses Annual Meeting, 1873.....		21 00
Stationery.....		26 25
Secretary's Salary.....		500 00—\$22,812 21

\$9,347 96

Due heirs of	Assessment.	Amount.
A. R. Walsh.....	63	\$1,000 00
T. A. English.....	R. fund.	850 00
R. B. Dillon.....	65	850 00
C. B. Mathews.....	66	850 00
A. J. Martin.....	67	1,000 00
V. A. Shea.....	68	900 00
Collected on Assessment.....	69	384 50
Advance Assessments.....		87 50—\$5,922 00

Balance—Amt. of Surplus Fund.....\$3,435 00

To which is to be added interest from July to Nov. 1st, making a total of about \$3,700 00.

Although some dissatisfaction has been expressed at the limitation of the amount of payment at death to \$1,000, yet it has been very limited, and we believe there has been a very general acquiescence in its wisdom. It has enabled the Association to pay an assessment out of its surplus funds, and yet now to report a very handsome balance on hand.

It is suggested that if the funds be allowed to ac-

cumulate until the interest of the surplus fund meets the current expenses it would greatly strengthen the Association. A like approval of the resolution to tax delinquent members a second initiation fee on their restoration has not been manifested, and your Executive Committee, after consultation, deemed it their duty to call for an expression of opinion on that subject and finally to suspend its operation. There seems needed a careful and prudent revision of the whole subject of delinquency and the privileges of resignation and restoration.

The policy of the Association is impliedly benevolent, and its rules should be generous as well as just. Delinquents are now restored only on a new certificate of health and the payment of all back dues. It seems to be the wish of many to modify these conditions so as to restore to membership many whose necessities drove them to resignation or delinquency under the pressure of poverty or personal calamity, and yet avoid encouraging the easy shedding of the duties of membership.

It is also suggested whether some definite amount of initiation fee, the whole of which shall be placed as a part of the permanent fund, may not take advantageously the place of the present sliding scale, however just it is acknowledged to be.

It is further suggested that to members residing beyond the Rocky Mountains, the term of payment of assessments be increased from 30 to 60 days. To all these points your intelligent attention is directed.

The Association reaches its seventh anniversary with what we believe to be a worthy record, and with all the conditions by which its future success and usefulness seems assured. The few faults which now impede its more enlarged and acceptable membership once removed, and the terms of connection made generous, the Association should find a friend in the entire brotherhood of the Telegraph, and go on with renewed vigor and widened usefulness and value. We are happy to report that Mr. W. B. Hibbard of Salt Lake City, and Mr. C. H. Haskins, Superintendent of the Northwestern Telegraph Company, have recently signified their design to take an active interest in securing members in their respective regions. At the suggestion of the latter gentleman, Mr. F. B. Gibson of St. Paul is addressing the operators of Minnesota on the subject, while he personally gives his attention to Wisconsin. From these and other indications of good will on many hands, there is every reason to believe that nothing is now needed to render the Association fruitful and permanent, but discreet counsels and loyalty to the sentiments upon which it was originally organized.

J. D. REID, *Treasurer.*

WILLIAM HOLMES, *Sec.*

After the reading of the Report, Mr. SCULLY of New York offered the following addition to Section 2 of the By-Laws.

"Any member desiring to withdraw from membership of this Association, may do so by paying all indebtedness to the Association, and receiving from the Secretary a certificate of withdrawal." Approved.

On motion of A. S. BROWN:

Resolved, That delinquent members shall be eligible to renewed membership on payment of back dues to an amount not exceeding five dollars, and without other initiation fee. Approved.

The resolution, of course, contemplates that the status of health shall be satisfactory as at the first, and so certified in due form.

Mr. A. S. BROWN offered the following amendments to the Constitution:

"At the next and all following annual elections of officers of this Association, delegates from dis-

tricts outside of the City of New York shall be entitled to cast as many votes as the number of members they represent, provided such delegates shall bring written evidence of their authority so to act. No person shall be allowed to act as delegate or representative of any district who is not himself a member of the district he represents." Approved.

On motion of A. S. BROWN:

Resolved, That in Section VIII. of the By-Laws, after the word "Association" insert "audit all claims and accounts."

Approved.

On motion of D. R. DOWNER:

Resolved, That the amount of the initiation fee be hereafter two dollars.

Approved.

On motion of J. W. TILLINGHAST of Buffalo:

Resolved, That during the fiscal year commencing Nov. 11, 1874, the Reserve Fund shall be increased to \$5,000, and during each of the two following years the sum of \$2,500 shall be added, and that thereafter the minimum of the Reserved Fund shall be Ten Thousand Dollars. Provided, that in case of extraordinary death rate the amount may be temporarily reduced by unanimous vote of the Executive Committee.

Approved.

On motion of F. W. JONES of Chicago:

Resolved, That the Executive Committee be enlarged to seven members.

Approved.

ELECTION OF OFFICERS.

JAMES D. REID.....*Treasurer.*

WILLIAM HOLMES.....*Secretary.*

Executive Committee.

J. M. CROWLEY.....Augusta, Ga.

C. H. SUMMERS.....Chicago, Ill.

R. H. ROCHESTER.....New York.

D. R. DOWNER.....New York.

A. S. BROWN.....New York.

ARGUMENT OF MR. G. P. LOWERY UPON THE POSTAL TELEGRAPH BILL.

(Continued from page 330.)

Eminent domain is a sovereign right inherent in each State of the Union *severally*. There is no eminent domain in which the States, *qua* States, participate in common. The surrender by each of the States of certain other sovereign rights, to be exercised for each and all by the General Government as a common agent, has doubtless, by necessary implication (aided by the terms of the last clause in the section enumerating the powers of Congress), carried along the power of eminent domain, so far as it required, in aid of the other sovereign powers transferred, and so far only. For those purposes it is vested in the General Government for the people of the United States.

The States may, and do, in respect to municipal affairs, delegate the enforcement of eminent domain to such persons or corporations as are engaged in public municipal uses. But it seems clear, from a consideration of the nature and source of our *National* functions, that they were all intended to be exerted by the National Government in its own name and *by itself alone*. None of its other powers by delegation have been thought subject to further delegation, and no reason appears for making the implied, and as yet wholly unused power of National eminent domain an exception.

The abandonment, by each State, of its power to build forts and light-houses doubtless involves a

simultaneous and equal surrender of the right which each State had within its own territory to appropriate private property for that purpose.

This transfer might, adopting the language in use concerning lesser or more easily defined rights, be called a creation of a power irrevocable and without power of substitution. What would be said if Congress, professing to be acting under the power to build forts, maintain armies, and carry on war, should attempt to delegate those powers to private persons? What would be said if it should authorize private persons to condemn land to build forts?

Whatever might appropriately be said in such cases, may be said whenever Congress shall, under its power to regulate commerce, or establish post-roads, assume to exercise eminent domain by delegation.

The root and justification of eminent domain is public use; and these remarks apply only to the exercise of eminent domain by Congress, within a State where all public uses (other than national uses, expressly so named by the Constitution) are the public uses of the State. They will not apply to the Territories or the District of Columbia, where all public uses are national public uses, belonging to the people of the United States.

As resulting from this limited and non-transferable character of the power of the General Government, we find that the restriction on the taking of private property, contained in the fifth amendment, is held to restrain the United States, but not to be applicable to a State or its reserved eminent domain. (*Pumpelly vs. Green Bay Comp.* 13, Wall., 177.)

Efforts have been twice made to obtain the passage by Congress of a general act providing "due process of law" for ascertaining the compensation to be made whenever the United States shall exercise such right of eminent domain as is conferred by the Constitution. In neither case did the bill pass. (Congressional Globe, 1859-'60; Part 2, p. 1790-1; Part 4, 3396; 1863-'64, vol. 65, p. 1559, 1661.)

An act of Congress appropriated money for the construction of roads to Fort Gaines, and directed the roads to be constructed under the direction of the Secretary of War. The owner of land over which the Secretary proposed to construct the road refused to give up his land therefor. Mr. Attorney-General Cushing's opinion was that—

The United States cannot take private land for the construction of a road in one of the Territories without some legal form of expropriation, either by act of Congress or of the Territory.

He said:

It is true that the United States may take private property for public use, but it cannot be done without "due process of law," nor without "just compensation." (Const. amend., art. 5.) No form of law has been provided for the present case, nor for any mode of giving compensation. The right exists in the Government as such, but it cannot be exercised by any particular officer of the Government without authority of Congress. (7 Opinions Attys. Gen., 320, 321.)

It appears clearly to result from these authorities, and the considerations to which they give rise, that the Government of the United States has no power to take title, by condemnation, to private property for municipal uses; and that, if it could do so, it has no power to authorize such condemnation by or to a private person or corporation.

The occupation which Mr. Hubbard's company must necessarily take of private property, in order to erect and maintain its lines, can only be rescued from the category of trespasses by being justified as an assertion of the eminent domain of the United States; and when it appears that there is no such eminent domain, it falls back again into the former

category, and must be recognized to be a mere trespass.

Mr. O'NEILL remarked that a good many years ago there was an evident clashing of jurisdiction as to the enforcement of Sunday laws in the city of Philadelphia, where chains were placed across the streets in the neighborhood of churches, so as to prevent the noise and confusion from vehicles. There was considerable commotion existing at the time, and it was decided that the obstructions to travel should be removed, inasmuch as the streets were post-roads.

Mr. LOWREY. Undoubtedly it would not be for the State to say at what time the United States should carry its mails; and any obstruction to the free carriage of the mails there would be within the power of the United States to prevent. But suppose that a great number of citizens, as in the case referred to, should desire to go to church on Sunday in the city of Philadelphia, so great a number as to constitute in substance the whole city, and that somebody had power to throw a chain across the street so that they could not get through, we should have a case exactly analogous to the case which Mr. Hubbard presents. He says that this business of telegraphing has got to be so great and important as to become a question of "national interest." Now, that is the difference between the careless use of words and the exact use of words. It does not make any difference what number of persons are interested in a thing, it does not become national unless it is made national by the Constitution. If all the people of Philadelphia wanted to go to church and were prevented, the very great number of them would, according to the ideas of Mr. Hubbard, authorize him to come to Congress and ask it to take some means to let the people of Philadelphia go to church.

Mr. O'NEILL. It was the extreme piety and morality of the State of Pennsylvania which brought that thing about; and the morality of the question had to yield on the very point of obstructing the United States mails.

Mr. LOWREY. In reference to the foundations of judgment, we are told that they are, first, facts; and second, presumptions from facts. I suppose the morality and piety of the people of Philadelphia are to be taken as a fact, not as a presumption.

Mr. O'NEILL. As a fact absolutely; that is so.

Mr. LOWREY. Coming back now to the subject I was discussing, I have said that the eminent domain of the United States does not extend to municipal subjects, and I should not venture before this committee (since I am to be answered by Mr. Hubbard) to make an assertion on any authority short of the Supreme Court of the United States, and so I will take the liberty of reading to you from 3d Howard's Reports, pages 23 and 24.

That court said:

The right which belongs to the society or to the sovereign of disposing, in case of necessity, and for the public safety, of all the wealth contained in the State, is called the eminent domain. It is evident that this right is, in certain cases, necessary to him who governs, and is, consequently, a part of the empire or sovereign power. (Vat. Law of Nations, section 244.) This definition shows that the eminent domain, although a sovereign power, does not include all sovereign power, and this explains the sense in which it is used in this opinion. * * *

When Alabama was admitted into the Union on an equal footing with the original States, she succeeded to all the rights of sovereignty, jurisdiction and eminent domain which Georgia possessed at the date of the cession, except so far as this right was diminished by the public lands remaining in the possession and under the control of the United States, for the temporary purposes provided for in the deed of cession, and the legislative acts connected

with it. Nothing remained to the United States, according to the terms of the agreement, but the public lands. And if an express stipulation has been inserted in the agreement, granting the municipal right of sovereignty and eminent domain to the United States, such stipulation would have been void and inoperative, because the United States have no constitutional capacity to exercise municipal jurisdiction, sovereignty or eminent domain within the limits of a State or elsewhere, except in the cases in which it is expressly granted.

By the sixteenth clause of the eighth section of the first article of the Constitution, power is given to Congress to exercise exclusive legislation "in all cases whatsoever over such district (not exceeding ten miles square) as may, by cession of particular States and the acceptance of Congress, become the seat of government of the United States, and to exercise like authority over all places purchased by the consent of the legislature of the State in which the same may be, for the erection of forts, magazines, arsenals, dock-yards, and other needful buildings. Within the District of Columbia, and the other places purchased and used for the purposes above mentioned, the national and municipal powers of government of every description are united in the Government of the Union. And these are the only cases within the United States in which all the powers of government are united in a single government, except in the cases already mentioned of the temporary territorial government. (*Pollock's Lessee vs. Hagan et al.*, 3 How. Rep., pp. 223, 224.)

(To be continued.)

PRESENTATION—J. A. NOBLE.

A very pleasant party met in the parlors of the McMeekin House in Topeka, Kansas, on the night of Sept. 30th, and presented Mr. J. A. Noble with a handsome gold watch and chain. Mr. Noble has held the position of train master and dispatcher for three years past on the Kansas Pacific Railroad. He is going to Texas to hold the onerous position of Division Superintendent on the Texas Pacific Railway.

THE EFFECT OF A GALVANIC CURRENT ON ELASTICITY AND LENGTH OF THE CONDUCTING WIRE.—As the result of a very complete investigation by Streintz into the effect of a galvanic current on the elasticity and length of the wire through which it is passing, the author gives the following conclusions:

1. The current does effect a change in the elasticity of its conducting wire, but only by virtue of the heat that is thereby developed.
2. The current extends the conducting wire more than it would be extended by simply warming up to the same temperature. Such excess of extension is inappreciable only in the case of hard steel.
3. The galvanic extension is effected, not suddenly in consequence of the completion of the current, but gradually, in a manner similar to the effect produced by heat.
4. The galvanic extension cannot be a consequence of an electro-dynamic repulsion, but probably consists of a polarization of the heat vibrations.

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JOURNAL OF THE TELEGRAPH.

VOL. VII. NO. 23.

NEW YORK, DECEMBER 1, 1874.

WHOLE NO. 170.

THE HUGHES PRINTING TELEGRAPH.

Translated from Schellen's Elektromagnetische Telegraph.

(Continued from Page 337.)

THE OBTAINING OF SYNCHRONISM, OR THE REGULATOR.

The Hughes apparatus is set up in the same manner at both the sending and the receiving stations, and as while in action the speed of rotation of both instruments is exactly the same, consequently the same letter on each of the type wheels is at the same time immediately over the impression roller, and can be printed upon either or both instruments by the depression of a key at the sending instrument. In order to secure perfect synchronism between machi-

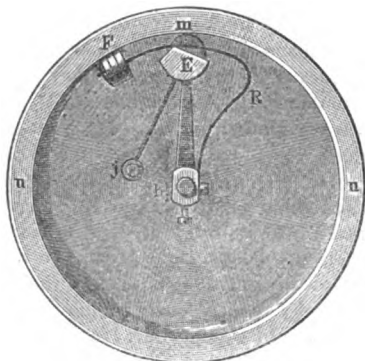


Figure 16.

nery so complicated, Hughes, at different times, employed several arrangements. The following is, probably, one of the best.

As will be seen in figure 7, a very elastic tongue is erected in front of the back wheel plate. To the lower end of this tongue a lever is attached by means of a spiral spring. Operating upon one of the arms of this lever, are the teeth of a wheel which lies behind, and connected with the wheel N. During the revolution of this wheel its teeth moves the lever to and fro, and, through the spiral spring, causes the steel tongue Z to vibrate rapidly. As this tongue vibrates quicker or slower, it operates on the cog wheel lying under N, and through that accelerates or retards the motion of the whole of the wheelwork. The vibrations of this steel spring can be regulated by lengthening or shortening, the same as with a pendulum. For this purpose a sliding weight, W, (Figure 7) is placed upon the steel tongue Z, and can be raised or lowered by means of a crank, G, the upper end of which is attached to the weight, and the lower end to a lever Q. When the weight is raised the vibrations grow slow and the speed of the instrument is retarded. When it is lowered the vibrations increase and the rapidity of the wheelwork is accelerated.

In a later form of the instrument, Mr. Hughes makes use of a fly wheel V, (Figure 8), fixed on the printing axis b_1 , to which is connected a horizontal conical pendulum P. The revolving speed of this

fly wheel depends upon the size of the circuit ascribed by the globe P, which can be regulated at the will of the operator.

To effect this, the globe P is attached to a steel rod tt , which can be moved up and down by means of the spring v , and the axle K U, along the real pendulum rod which is fixed at N, and which is caught at j by the crank mj . The crank j is revolved by the crank m which is on the axis of the fly wheel V. The pendulum P consequently describes a larger or smaller circuit around the axis $b_1 m$, according to the speed of rotation. When the speed increases, the globe P gets farther from the axis, but then, however, through the lever system $j m$ it exercises a stronger pressure against a brake ring, and by the increased friction, the circuit described by the globe is lessened and the speed of the wheelwork retarded. The position of globe P on the pendulum rod is regulated by the operation of the tooth spring v , K U on rod tt . When the speed of the wheelwork increases, the increased friction of the brake ring at uu acts as a check, and *vice versa*, so that the apparatus is self-regulating, and its motion is continued for a long time with unvarying regularity. Should, however, either of the co-operating apparatuses run faster or slower than the other, it can at once be brought into harmony by turning the regulating screw v , which will bring the globe P to its proper position.

In another form of this construction, the pressure of the brake against the brake ring uu is made to take place from the inside. The arrangement then is as follows: (Figure 16.)

The globe P, rod tt , the attachment of the pendulum rods at N, and the regulating arrangement, v K U are the same as above described. The rod tt stands almost horizontally, (not visible in the drawing) the brake ring uu vertically, and, in its centre,

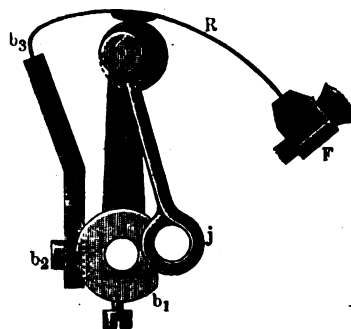


Figure 17.

on the axis b_1 of the fly wheel, a lever, $b_1 m$, is placed which turns with the fly wheel. On the pivot m of this lever a strong steel wire is fixed, rectilinearly bent into a very powerful spring. The extreme end of this spring j , forms a small ring in which is placed the end of the pendulum rod where it can move freely. On this spring mj is an eccentric disc E to operate upon another powerful spring, R, which is attached to the axis b_1 , and upon which is the rubbing friction F. The entire system, $b_1, mj, E R F$ turns

with axis b_1 of the fly wheel V, (Figure 8) within the permanent ring uu .

When the apparatus is in action, the axis b_1 which revolves continuously, sets the conical pendulum in motion through lever $b_1 m j$. If the correct speed is attained, the rod $m j$ remains a certain distance from $b_1 m$, not so far, however, as represented in the drawing. Should the speed increase, the rubbing friction F is pressed against uu by the eccentric E, and the speed is at once decreased.

In the latest construction, Mr. Hughes has somewhat simplified and improved the brake arrangements, as shown in figure 17. Instead of the pivot m with the eccentric, a cylinder of bone is used which is fixed eccentrically on the axis of the brake lever b_1 and presses immediately on the brake spring R. This brake spring, upon the strength and an-

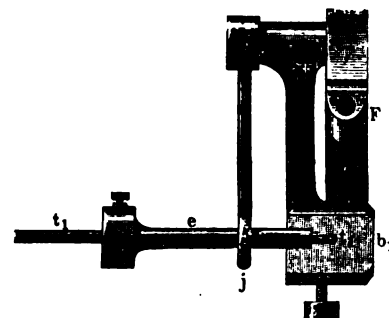


Figure 18.

gularity of which the efficacy of the entire brake depends, reaches to the point of fastening, b_2 , by being placed into a rigid arm at b_2 . In this manner the proper form of the spring is more easily established and kept.

In place of the rubbing friction F, (Figure 16), a piece of hempen cord, the rubbing end of which somewhat resembles a brush, is used. This friction is much more uniform and needs renewal very seldom.

In order to prevent wear on the thin end of the vibrating pendulum rod tt , a small steel collar, e , (Figure 18) is placed over the rod at that point and held firmly by means of a screw.

(To be continued.)

ELECTRICITY FOR TOOTHACHE.—A Paris Journal states that Dr. Bouchard of that city finds the use of electricity very efficient in cases of severe toothache, a perfect cure, even where the teeth are greatly decayed, being not unfrequently obtained, and temporary relief almost invariably ensuing. In numerous instances, where alleviation at first was of short duration, the effect became more and more marked, and lasted longer, as the treatment was repeated. The method pursued by Dr Bouchard, in applying the electricity, is to place the positive pole of the current on the cheek opposite the diseased tooth, and the negative upon the anterolateral portion of the neck; and to avoid the ulcerations, the electrodes are made very large, and their place frequently changed. The application is continued for about half an hour, although relief is frequently experienced in ten or fifteen minutes. A battery of about ten elements is used.

ARGUMENT OF MR. G. P. LOWREY UPON THE POSTAL TELEGRAPH BILL

(Continued from page 846.)

The CHAIRMAN. What is the date of that case?

Mr. LOWREY. That is probably about 1844-'45, or possibly earlier; but that ruling has been followed ever since; and that is a perfectly clear limitation of the powers of the General Government. It has the right of eminent domain only in respect of those things which I have been talking about—the building of custom-houses, light-houses, post-offices, &c. But when it comes to the opening of highways and the providing of railroads, and the doing of numerous things known as municipal uses, it has no constitutional capacity, even by consent of the State within whose jurisdiction it may attempt to exercise the power.

Having agreed that the right of eminent domain is in the United States for all constitutional national uses, it becomes material to see whether the incorporation of Mr. Hubbard's company may by any construction be classed among such uses. Certainly there is no express language of the Constitution referring either to him by name or to the general subject of telegraphy. It is, however, well understood that the Constitution contains implied as well as express powers, and if the business of this proposed company is by fair implication within any of the subjects expressly controllable by Congress, then my argument upon this point must fail.

The shadowy intimation made by Mr. Hubbard of a power to authorize private persons to build telegraph lines, as derived from the commercial clause of the Constitution, flitted before us quickly. On that and on the still more spectral and fleeting appearance of the post-office clause in his argument, he built his light suggestion of a constitutional power in the Government to set him up in our business to our exclusion.

Mr. CHAIRMAN. You would call it in the *penumbra*, perhaps.

Mr. LOWREY. Yes.

Mr. LOUGHRIDGE. You admit that the Government, having the power to establish a post-road, has the power to build means of transit.

Mr. LOWREY. Yes; such means as may fairly be called post-offices or post-roads.

Mr. LOUGHRIDGE. I understand that you admit that the Government has the right to go upon the lands of railroad companies, and by legal means, to a certain extent, set up a telegraph line, considering the telegraph as a means of carrying communications.

Mr. LOWREY. It is not to be so considered at all. I should make a very broad distinction on that point between the post-office as a means of carrying mail matter and the telegraph as a means of transmitting information. I do not at all admit the constitutional power of the Government to set up the telegraph for any purpose; except, perhaps, to transmit its own communication on its own business to its own agents.

Mr. PORTER. But, even for the purpose of the post-office, the Government has no power to condemn lands without compensation, much less to transfer such a power to Mr. Hubbard.

Mr. LOWREY. Congress has the right by the Constitution (observe the language) to "establish" post-offices and post-roads. That is all that it has the right to do on that subject. If anybody is prepared to show that telegraphing is the "establishing post-offices and post-roads," then Congress may do it. The power to establish post-offices and post-roads is reposed in the General Government, but telegraphing

is a different thing. I may as well discuss the post-office clause just here. There are two provisions of the Constitution to be contrasted—what is known as the commercial clause and what is known as the post-office clause. Congress is authorized by the Constitution to "establish" post-offices and to "establish" post-roads. It is authorized by the same Constitution, and in immediate juxtaposition of phrase, to "regulate commerce." Not to "establish" commerce; but to "regulate" post-offices and post-roads. There was evidently a reason for this distinction, and it requires but little reflection to find the reason. The post-office is something capable of being established; something capable of being held under one control and of being managed by one power. It is a conception of the mind, an agency for doing a particular thing. It is mistakenly supposed to be an agency for the communication of information. It is primarily nothing of the sort. It is a confused mingling of ideas that so treats it. The post-office is an instrument for the conveyance of certain classes of parcels. Whether the parcel contains information, or what use the sender of the parcel will make of it: whether he will send in it a package of seeds for his gardener or a specimen of lace for his wife; whether he will send in it a message for his family, or a printed document, is his affair. The Government tenders itself merely to carry parcels of a limited weight for a limited price. And it is by mixing things that have no essential relation; by confounding essential things with the customary idea of the thing, that we come to have here the telegraph and post-office spoken of as being precisely similar agencies; and an argument built thereon that since the post-office may be used in its way for transmission of information, and is an agency solely within the power of Congress, that therefore the telegraph, which can be used for nothing else but transmission of information may also be controlled by Congress. A complete logical application of the claim will of course exclude the States from a power so long exercised by them, of legislating concerning telegraphing, as they are confessedly excluded from all legislation concerning the mails. Suppose that at the submission of the Constitution it had contained in place of the present post-office clause another, embodying Mr. Hubbard's present construction of that clause as follows: "*The United States shall control exclusively all means by which people may communicate information;*" can any one believe it would have been adopted?

The CHAIRMAN. Do I understand you to say that the post-office is essentially an express agency?

Mr. LOWREY. It is essentially an agency for carrying matter which can be weighed and handled.

The CHAIRMAN. The manner in which you have described it would define an express company.

Mr. LOWREY. Yes; that is to say the express company is one that carries parcels. The post-office is an agency, the original design or *motives* of which was doubtless to favor the transmission of intelligence, public and private, between the people; but its *function* is solely to carry a class of parcels in which the sender may place his own signs conveying information or what else he chooses. From the exercise of this *function* (i. e., carrying sealed packages which are susceptible of containing information) Mr. Hubbard seeks to imply a larger and exclusive function of controlling *all communications of information*. The post-office does not interfere with, touch, or comprehend the information. It does not put any intelligence into the transmission of it as information. It does not say to the man who wants to send a message, "I have here an intelligent servant just going to New York who will remember all you may com-

mit to him and repeat it correctly to the person whom you wish should hear it." That is precisely what the telegraph company does. The telegraph *conveys* nothing, but *transmits* information as such. The post-office transmits no *information as such*, and only conveys certain *material substances*.

Some gentlemen who have devised means whereby, by signs, they can understand each other, meet for instance at this table. Let us suppose that the chairman and I are in that business. He sits at one end of this table and I at the other. By articulate sounds I am able to convey to him the impression that is on my mind. Suppose that we separate a little farther, and that we have devised signals whereby, by certain motions of the hand, we understand each other and converse together. That is not like the post-office. Then suppose we go a little farther. Suppose we go on opposite hills, within sound of the voice, and that I shout to him so that he understands what I say and communicates his answer; that is not like the post-office. Now let him go to New York, while I remain in Washington, and let me be able, by means of a wire, to convey ideas to him by preconcerted signals. That is a description of the exact business of communicating information, the agent of communication himself being a party to the information. Now this communication of ideas by the telegraph is like the assembling together of all the people of the United States in Washington, so that they can hear each other's voices. It is practically that, because by means of the telegraph they are able to hear each other without assembling in Washington; and that is the kind of business which Mr. Hubbard recommends you to have the Government undertake the control of, because it controls a totally different agency by which people may send parcels which may contain information. He says that communications between people have become so important, that the Government should assume the control of all methods by which such communications are effected. I doubt whether Mr. Hubbard recognizes the full meaning of what he recommends a Republican Government to assume.

The CHAIRMAN. Now that I understand what your definition of a post-office is, I would like to know whether you reach that definition by historical research or by analysis of the words and terms which you find in the Constitution.

Mr. LOWREY. Neither.

The CHAIRMAN. You reach it out of your own inner consciousness?

Mr. LOWREY. I reach it by analysis of the functions which the post-office in fact performs.

The CHAIRMAN. You must admit, however, that it is only within the last two or three years that the parcel feature of the post-office has been introduced. Until quite recently nothing but packages containing intelligence were sent through the post-office.

Mr. LOWREY. Excuse me, how do you know that? The packages were sent, but what can we know of their contents?

The CHAIRMAN. So far as the law contemplated it. The law speaks of written matter and of printed matter, and makes a differential tariff according as the intelligence is put in print or in writing. Running all through the original work of the Post-Office Department, it would seem to me that the base of all was intelligence in various forms. I am curious to know, as a matter of history, whether any other thing than that was contemplated.

Mr. LOWREY. I am not possessed of the history of the subject, but I perceive that I have not been quite successful in delivering my idea on this point. I do not mean to say that the *object* of the people in

establishing the post-office was not chiefly that they might communicate information to each other. I mean to say that the post-office does not interfere in respect of the information, and therefore its existence is no evidence of a general design in the Constitution to clothe Congress with power touching *all means* of communicating information *per se*. It does not open a letter which it carries to see if it contains information, or reject it if it does not. It does not act or exert its powers upon the information. It is an agent for conveying parcels, and it acts upon and in reference to them as parcels solely, which may or may not contain information. Contrast that work with the action of the telegraph, which cannot act at all except upon information, as a purely intellectual subject. You can predicate substance and space of what the post-office receives and transmits, but you cannot predicate these of anything which the telegrapher receives and transmits.

Mr. HALE. The earliest regulations of this right of the Government were in the direction of antagonizing your peculiar theory and of sustaining the other theory. That is, it allowed letters at certain rates, and it allowed larger packages and parcels at less rates, because they were printed, and conveyed in bulk, in the aggregate, much more information than the letters did, so that the discrimination in the earliest laws relating to the Post-Office Department was against your theory that it was a parcel agency or express business.

Mr. LOWREY. That was a discrimination based upon a special reason of political economy. It was and is now considered desirable to favor the spread of general knowledge and information by means of newspapers and books; and it was on this general consideration thought desirable to make the mails serve the cheap circulation of general information, just as a merchant makes a special price for an article he desires to introduce. The carriage of newspapers and books is not forbidden to other carriers, and yet as they are repositories of information, on Mr. Hubbard's argument that Congress has a control necessarily exclusive of all means of communicating information, it might forbid their carriage except by the mails, or their manufacture except by the Government. Is it believed that enactments effecting either of these results could be sustained?

Mr. HALE. Still, if it were run as a parcel agency, printed matter, weighing much more than written matter, would have to pay more, would it not?

Mr. LOWREY. The character of the parcel and the interest of the public in having it carried cheap enters into the matter, and has doubtless controlled in the fixing of the price. I should much grieve to be understood as making merely a fanciful definition. The definition of the primary function (not purpose) of the post-office which I am seeking to establish is, I think, based upon sound and essential considerations and distinctions.

Mr. O'NEILL. Do you mean the committee to understand that the letter itself is a parcel?

Mr. LOWREY. Yes.

Mr. O'NEILL. Whether it be a postal card, a two cent letter or a newspaper?

Mr. LOWREY. Certainly.

Mr. MARSHALL. You mean to say that all that the mails carry are simply parcels, while the telegraph conveys nothing material?

Mr. LOWREY. That is it precisely. It is urged that you may set up the telegraph business *because* you have set up the post-office. Having stated the two things, Mr. Hubbard finds that that does not prove anything. Therefore he must try again, and says "The post-office is set up to convey information; the telegraph is set up to convey information;

therefore the Government having set up the post-office to convey information, it must also set up the telegraph to convey information." That is where I take issue with him. I say that the telegraph is not an agent to convey information in the sense in which the post-office was instituted. The post-office was a specific, known device, at the time, for facilitating intercourse between the people, and in the Constitution this Government was authorized to establish and maintain it; but it cannot, by inference, seize hold upon every other new means of conveying information. I insist that in its essential character the mail is not a means of conveying information. I am about to argue as strongly as I can against any attempt by the Government of the United States to assume the exclusive control of all means by which citizens may interchange ideas. If you begin once to seize upon the interchange of information between people you have done an act characteristic of the most despotic Government, and you have only to pursue it to its logical consequences to have entire control of all interchange of thought between the people.

I have before alluded to the telegraph as being substantially a means of personal conference, in which space is annihilated and mind brought to act on mind, in manner precisely analogous to face to face conversation. We meet here in Washington and talk. We retire a little farther, and are heard by raising our voices. We go a little farther still, and are heard by tapping upon a hard substance. We go a little farther still, and are heard by using instruments and telegraphic wires. All the time there is direct contact of mind with mind; and the similarity, so much relied upon, between the post-office and the telegraph, disappears entirely before an accurate analysis of the two.

Mr. PARKER. Does not the Government already exercise the right of discriminating between the information which it conveys in the mails? Does it not seize and confiscate certain classes of information? And is not that an exercise of the power which is claimed by the Government of the United States under the constitutional authority to regulate commerce.

Mr. LOWREY. Unquestionably, we all agree that, in the case of obscene publications, morality is served by their seizure and detention, and while nobody would object to the use of the means of preventing their circulation, still it is a dangerous exercise of power. It would be a dangerous thing for Congress to authorize the post-office to judge of the matter to be sent between man and man, so long as it is not dangerous to the mails themselves, such as explosive materials. I think it is a dangerous exercise of power, and that it belongs to that class of dangerous exhibitions of power which threaten the republican government in this country more than anything else.

Mr. HUBBARD. Does not the Western Union Telegraph Company do the same thing—exclude obscene communications from its office?

Mr. LOWREY. I do not know whether that has been done or not. But I am not aware that the Western Union Telegraph Company is the creature of the Constitution of the United States, or that its action or non-action has any political importance entitling it to be discussed here. I presume it has the same right to refuse to transmit obscene communications that you have in your private capacity.

Mr. PARKER. A man was arrested in my town the other day for writing on a postal card that the postmaster of Chicago was an ass—that is, a dull fellow.

Mr. LOUGHRIDGE. The Government of the United

States is simply a corporation, and the Western Union Telegraph Company is a corporation also. The one is a public corporation; the other a private corporation. May it not become just as dangerous for a private corporation to grow so strong as to be able to control and keep down all other corporations as it would be for the Government to do so?

Mr. LOWREY. I am not aware that it is a political or legal offense for one person or corporation to overcome a competitor in fair competition, provided law is not invoked to give one advantage over another. I object to Mr. Hubbard's bill, because it would have that effect. The danger of the Government assuming power is that it has no master; there is nobody to appeal to from it. If the Western Union Telegraph Company assumes unwarranted power it has a master in the law, and it has the public to judge it; so that there is far less danger of abuse of power in the hands of a private person than in the hands of the Government.

Mr. LOUGHRIDGE. The people can at any time control the Government.

Mr. LOWREY. The people seldom unite upon any question of unlawful or oppressive exercise of power until the danger becomes so great as to be sufficient to justify political or warlike revolution. I hardly think it necessary to do more than appeal to ordinary experience to show that governments are the most unsafe depositories of unlimited power. That was the judgment of our forefathers when they established the Constitution. That seems to be ceasing to be our judgment, and we are gradually treading down the barriers which they established.

I should like to refer here to the use of the word "monopoly," a very offensive word, of course. I am not aware, however, that that monopoly which is gained by superior enterprise, by the holder risk of capital, by better service to the public, is an offensive monopoly. On the contrary, it is the reward which each one of us seeks for doing his business well. Each one of you has a monopoly in representing his district in Congress.

Several MEMBERS. No monopoly at all.

Mr. LOWREY. Since you disavow it I need not insist upon the illustration, although it seems to me that each of you, by deserving the confidence of your constituents, has secured the legal monopoly of casting their vote in the national assembly during your term of office.

(To be continued.)

NEW MAGNETO MECHANICAL SEPARATOR

A new form of magnetic separator, for the removal of fine particles of iron that become mixed with turnings and filings of copper and brass from workshops, has recently been devised by M. Varin, of Paris.

Two superposed hollow cylinders turn in the same direction, and upon them the material to be separated is scattered through a hopper. The surface of the cylinders consists in bands of soft iron which are kept in a magnetic state. The particles of iron are attracted to these cylinders, and at a certain period of revolution are brushed therefrom into a receptacle, while the scraps of other metal fall to the bottom of the apparatus. The machine is said to be capable of separating 1,100 pounds of material per hour. It has also recently been employed by M. Mangon, for detecting titanic iron in arable earth, with remarkable precision, the iron, in such small quantities as 15 or even 7 grains in 22 pounds of earth, having been readily separated.

THE Mexican Congress is appropriating money for new lines of telegraph.

CORRESPONDENCE.

"THE NEED OF NEW RULES."

NEW ORLEANS, LA., Nov. 22d, 1874.

To the Editor of the Journal of the Telegraph:

Under the above caption your readers are invited to the solution of a problem put forward editorially in your issue of the second instant. The question related to the delivery of business which is some times taken for points too far from any one of the company's offices for delivery in the ordinary way.

The accepted solution must, of course, tend to prevent mistake in transmitting, and accelerate the delivery of the message; also to promote cheapness of tolls, or brevity in the composition of the dispatch, and insure the company fully against loss.

I beg to submit, practically, the following:

A message is presented from

ROSEVILLE, August 10, 1874.

To JOHN DIDWELL, Pottstown,

By Special Messenger from Cooksburg:

"The business cannot be deferred; time expires Wednesday. Return at once."

"THOMAS PRESTON.

19 pd. 2.40.

Report guaranteed charges."

In this example we count the words "by special messenger from Cooksburg"; also "report guaranteed charges." Thus, we blend without mixing, the necessary notification and instruction so intimately with the message itself, that if it reaches Cooksburg, they must.

The answer comes:

COOKSBURG, August 10, '74.

To Roseville office:

"Preston to Didwell, Pottstown, forwarded four P. M. Charges five dollars. OFFICE."
10 collect 1.50.

The tariff on this reply is added to the bill for delivery charges, and collected from Mr. Preston.

But a reasonable time elapses and Cooksburg is not heard from. Then Roseville sends paid office message to Cooksburg, asking for answer, and another, if necessary, to fix the responsibility, turns in the same as "uncollected," and has the party in fault, whoever he be, and wherever located, made to foot the bill.

In this way the company could lose nothing, and no employé need suffer in conscience or pocket, except by his own remissness.

"Collect guaranteed charges" would answer in place of the other words in the check, whenever the receiver of the telegram was expected to pay for its delivery.

Yours respectfully,

PELICAN.

CHICAGO, Nov. 18th, 1874.

To the Editor of the Journal of the Telegraph:

Apropos of the invitation extended by the W. U. Co. to managers throughout the country, inviting the formation of new rules, and the alteration of old ones to cover cases not now protected or provided for, simplifying and rendering them easy of comprehension by young managers, as well as old ones, I would suggest, as one of the ends equally desired and sought after, the printing of a "Guide to Managers" in either end of all tariff books hereafter published, and also as a "Supplement to the JOURNAL," showing, in *fac simile*, all blanks and forms used by the Company in the transaction of their business, allowing one page for each blank, together with the numbers of the rules as adopted governing or affecting that particular blank or form.

I would also suggest that each blank be partly filled out by using script type, or some other suitable type, in the place where it is intended to be written out. Thus furnishing a guide that will not only appeal to the sense of sight, but to reason as well.

The importance of this fact is appreciated very highly by the Government (see U. S. Army Regulations, 1863), and has been found to work admirably.

I would further suggest that the heading of each blank have the word "State" printed after "office," leaving a blank space to fill in the name of State, or, if crowded for room, its abbreviation. This omission in blanks now used seems unpardonable, and should be corrected as early as possible.

I would still further suggest that the rules which are to be adopted should be published in the tariff books also, as a means of ready reference, and the liability of loss and misplacement of rule books be thereby avoided.

The additional expense incurred is not to be compared to the benefits that will accrue to the Company, as well as to the satisfaction that would be in store for those who are obliged to make and examine reports.

A. H. CROCKER, Report Clerk.

To the Editor of the Journal of the Telegraph:

In the JOURNAL of October 15th, page 308, a problem is presented by Mr. A. S. Brown, under the shape of a bridge, and the resistance between A and B is required.

Let CD be the cross wire, E the electromotive force in the wire outside of the bridge, a the resistance of that wire, x the intensity of the current in the same; b, c, d, e , the respective resistances of each branch with the corresponding intensities z, g, p, q , and f the resistance of the cross wire with an intensity y ; assuming also, for instance, that the current runs from C to D in the cross wire, C being situated between b and c , we have, according to the fundamental laws which govern the propagation of electricity, the three following equations at first:

$$(1) a + x + c + g + b = E \text{ (in circuit AEB).}$$

$$(2) c + g + f - y - d - p = 0 \text{ (in circuit DCB).}$$

$$(3) f + y + e - q - b - z = 0 \text{ (in circuit ADC).}$$

for, if we consider the current as going around in each circuit separately, the sum of the produces of the resistances of each side by the corresponding intensity, is equal to the sum of the electro-motive forces which we consider as producing currents of the same direction.

If for several sides, the current should have an opposite direction, or if the electro-motive force gives a contrary current, it becomes necessary to give a sign *minus* to the intensity or to the electro-motive force.

Four more equations can be obtained by indicating that at each point, A, B, C, the quantity of electricity which arrives from one side is equal to that one which goes out through both others, or *vice versa*; it is to say that the sum of the intensities of the currents in the wires which end at each point is *nil*.

$$(4) x - g - p = 0.$$

$$(5) q - p - y = 0.$$

$$(6) g - y - z = 0.$$

A fourth equation could be obtained, but it is a consequence of the three others.

Thus, six equations of the first degree are obtained by which any of the six unknown quantities, x, z, g, p, q, y , can be obtained in function of the known resistances.

These equations lead to the general solution of all the problems of this class. In the actual problem

we want the algebraic value of x , which the resolution of the precedent equations gives as follows:

$$x = \frac{E(b+e)[f(b+c+d+e) + (b+e)(c+d)]}{[a(b+e) + e(b+c)][f(b+c+d+e) + (b+e)(c+d)] + [c(b+e) + f(b+c)](bd-ce)}.$$

This formula gives the intensity of the current in the wire where the battery is, and where such current can also be measured.

On another hand we have, according to Ohm's laws, the formula $R = \frac{E}{I}$ in which R represents the resistance, and I the intensity of the current between A and B.

If in this formula we substitute to I its value, which is the same as that of x , we find for R after all simplifications, the following value:

$$R = \frac{e(b+c)}{b+e} + \frac{c(b+e) + f(b+c)}{(bd-ce)[f(b+c+d+e) + (b+e)(c+d)]}.$$

To apply this formula to the actual problem, the direction of the current in the cross wire being cared for, the precedent letters have to be represented by the given resistances as follows:

$$b=4000 \quad e=2000$$

$$c=1000 \quad f=1000$$

$$d=3000,$$

which transported in the formula, gives:

$$R = \frac{2000(4000+1000)}{4000+2000} + \frac{c(b+e) + f(b+c)}{(bd-ce)[f(b+c+d+e) + (b+e)(c+d)]} = \frac{6000 [1000 (4000 + 1000 + 3000 + 2000) + (4000 + 2000) (1000 + 3000)]}{15}$$

and finally $R = \frac{2205}{17}$ which is the required resistance.

GEO. D'INFREVILLE.

BOSTON, Mass., Oct. 5, 1874.

To the Editor of the Journal of the Telegraph:

I venture to give the following solution of the problem in JOURNAL of January 1st, as deduced from Kirchhoff's laws, for joint resistance of lines between A and B:

$$1000(3000+3000)(1000+4000) + 1000 \times 3000(2000+4000) + 2000 \times 4000(1000+3000)$$

$$1000(1000+2000+3000+4000) + (1000+3000)(2000+4000) - 2205.8822 +$$

GEO. A. HAMILTON.

To the Editor of the Journal of the Telegraph:

Please inform me through the JOURNAL, how many words Coxes Station should be counted. If St. Louis is counted two words and Rock Island Depot three words, why should Coxes Station not be counted as two words?

MANAGER.

Answer.—If Coxes Station is the name of a place it is right to count it as one word. If it is a *thing* in a place, it should be counted as two words.

Neither St. Louis nor Rock Island are counted as two words, unless the names are used as titles.

To the Editor of the Journal of the Telegraph:

I submit the following problem to your readers: "Construct a Self-breaking Repeater with two ordinary relays and two sounders only, adding no extra point, contact spring, or appliance whatever to either instrument, each circuit to have a battery at both ends."

THOS. A. EDISON.

THE Indian Government land lines, which were interrupted by the cyclone have been repaired and messages are again being forwarded from Calcutta, via Suez and Falmouth, with regularity.

THE COMPOSITE NATURE OF THE
ELECTRIC DISCHARGE.*

BY PROF. ALFRED M. MAYER.

In 1842 Prof. Joseph Henry inferred that the discharge of a Leyden jar was multiple and oscillatory in its nature. Feddersen, Rood and Cazin have since then confirmed Henry's inferences by a series of experiments with revolving mirrors and rotating disks perforated with narrow radial slits. Prof. Mayer's first method was to attach a delicate metallic point to a vibrating tuning-fork and to send an electric discharge from this point through lamp-blackened paper stretched upon a revolving metallic cylinder. The electric discharge can to some extent be thus analyzed in these conditions from the series of perforations left in the paper in the trail of the vibrating fork, but the method is useless as a means of investigation, for the metallic cylinder, the paper, and the fork form a species of Leyden jar in the circuit of the discharge being investigated. The Professor next tried a cylinder covered with thin printing paper well blackened over burning camphor, the paper being removed from the cylinder and cut into disks of about 15 centimeters in diameter. When one of these disks is revolved very rapidly it is rendered quite flat by centrifugal force action. When in this position the discharge between the points or balls perforates the disk and leaves a permanent record of its character, of the duration of the whole discharge, and of the intervals separating its constituent flashes and sparks. To obtain the time of rotation he used the method invented by Young (see *Natural Philosophy*, vol. 1, p. 191). By presenting momentarily to the rotating disk the delicate point attached to a vibrating tuning-fork, the number of vibrations per second of the fork was determined to the last degree of precision by means of a break-circuit clock, which sends at each second a spark from an inductorium through the fork. The result is traces on the blackened paper disk. The axis of the sinuous line on the disk is traced with a needle point, and then on drawing radii through symmetrical intersections of this axis in the sinuous line, we divide the disk off into known fractions of time. The disk is removed from the rotating apparatus, and the carbon is fixed by floating the disk for a moment in thin spirit varnish. When the disk is dry and flat, it is centered on a divided circle, provided with a low-power reading microscope and the duration of the whole discharge, and the intervals separating its components can be determined to $\frac{1}{1000}$ of a second. Many results have been obtained which Prof. Mayer withholds for future publication until he has carefully examined them. He proposes to study not only the discharge of the inductorium, but also of the frictional machine, the Leyden jar, and of the Holtz machine. He furnished as examples of the value of the method the results he obtained in three conditions of experiment:

I. Discharge of large inductorium points one millimeter apart. The striking distance of the coil between brass points was 46 centimeters M. On holding the disk between the eye and the light it was found to be perforated with 33 clean round holes. The portion of the discharge which makes these holes lasts $\frac{1}{10}$ second, and the holes are separated by intervals which gradually decrease in size toward the end of the discharge, so that the last spark holes are separated about one-half of the distance which separates the holes made. At the beginning of the

discharge the average intervals between the spark holes is $\frac{1}{10}$ second. After this portion of the discharge has passed there is a period of quiescence, lasting about $\frac{1}{1000}$ second; then follows a shower of minute sparks which forms the short dotted line above spoken of. The spark shower lasts $\frac{1}{10}$ second, and is formed of 30 sparks. Here the average interval separating these sparks is $\frac{1}{1000}$ second; they are not uniform, however, but smaller in the middle of the shower than at the beginning and at the end of the phenomenon.

II. Discharge of large inductorium between platinum points 1 millimeter apart with a Leyden jar of 242 square centimeters, connected with the terminals of the secondary coil. The discharge in its path around the disk dissipates little circles of carbon. There are 91 of these circles, each perforated by 4, 3, 2, or 1 holes. The discharge in the above experiment lasts $\frac{1}{10}$ of a second; the flashes at the beginning of discharge are separated by intervals averaging $\frac{1}{10}$ second up to about the tenth flash; they rapidly close up, so that during four-fifths of the discharge they follow each other at $\frac{1}{100}$ second. During the last fifth the intervals gradually increase, and the last flash is separated by $\frac{1}{1000}$ second.

III. Discharge of large inductorium between brass balls one centimeter in diameter, separated one millimeter with Leyden jar of 242 square centimeters inner coating. This discharge also lasts $\frac{1}{10}$ second, and is similar to the preceding.

STATISTICS OF GOVERNMENT TELE-
GRAPHS FOR 1873.

The following table shows the results of the operation of the telegraph in Germany, Hungary, Belgium, Denmark, France, Holland, and Switzerland, for the year ending December 31, 1873, being all the reports which have come to hand. It will be observed that the expenditures in these seven countries alone exceed the receipts by \$1,075,510.

Object of statistics.	Germany.	Hungary.	Belgium.	Denmark.	France.	Holland.	Switzerland.
Length of lines in miles.	16,999	8,319	2,916	1,377	30,779	2,088	3,482
Length of wires in miles.	64,733	2,339	12,551	4,354	79,363	7,273	6,784
Government offices.	1,469	791	437	103	2,344	149	715
Railroad or private offices.	1,856	493	130	69	.....	169	85
Total offices.	3,325	1,284	567	172	.....	318	800
Interior messages sent.	7,594,332	2,039,332	1,732,977	540,565	6,082,115	1,309,013	1,541,075
International messages sent.	1,543,317	92,350	381,534	100,082	857,354	251,765	574,333
Total messages sent.	9,137,649	2,131,712	2,064,431	640,647	6,939,469	1,560,778	2,115,408
Receipts of interior messages.	\$1,439,290	\$698,332	\$191,033	\$45,723	\$1,502,163	\$171,317	\$132,775
Receipts of international messages.	1,133,030	131,437	131,437	94,594	1,350,145	100,032	126,337
Sundry receipts.	17,274	29,717	493	3,093	250,257	100,032	35,118
Total receipts.	\$2,599,594	\$859,486	\$312,963	\$143,410	\$2,102,665	\$361,349	\$294,230
Extraordinary expenditures.	853,707	75,035	73,797	35,694	353,000	47,918	26,354
Ordinary expenditures.	2,693,744	765,141	438,398	124,151	2,058,000	414,076	313,574
Total expenditures.	\$3,547,451	\$840,176	\$512,195	\$160,844	\$2,411,000	\$461,993	\$340,128

* Abstract of a paper read before the American Academy of Science.

SOME NEW GALVANIC BATTERIES.

A correspondent of the *Scientific American* writes to that journal concerning several new forms of the galvanic battery, a short description of which will interest our readers.

I. A copper pot is filled with dilute sulphuric acid, inside of which is placed the ordinary porous cup, filled with a strong solution of sal ammoniac in water, in which is placed the amalgamated zinc. The sulphuric acid, entering through the porous vessel, decomposes the chloride of ammonium, setting free the hydrochloric acid, which, in turn, attacks the already oxydized zinc, forming water and chloride of zinc.

II. In a jar, of about six inches diameter by ten inches high, is placed a carbon plate, within a bag of unrolled leather; the bag is surrounded by peroxide of manganese, closely packed; the jar is then filled with a strong solution of sal ammoniac to which a few drops of hydrochloric acid are added; a plate of amalgamated zinc, of the same dimensions as the carbon plate, is placed in juxtaposition with the carbon. The action in this closely resembles that of the well known Leclanché cell. Constancy of action and large electromotive force are claimed for it.

III. A copper pot or cylinder is taken, inside of which is placed a porous cup filled with a strong solution of sal ammoniac in water and a plate of zinc (amalgamated). The outer vessel is filled with rain water, in which is placed a quantity of lucifer matches surrounding the porous cup. This form of battery is simple yet powerful. The matches seem to furnish a supply of ozone which is really its motive power.

SCIENCE AS KNOWN TO THE ANCIENTS.

In Egypt, mummies have been found with teeth filled with gold, and in Quito, a skeleton has been discovered with false teeth secured to the cheek-bone by gold wire. In the museum at Naples, among some of the surgical instruments discovered at Pompeii, there is a fac-simile of Sim's speculum. In the ruins of Ninevah, Layard found several magnifying-glasses.—*Med. Record.*

TRAIN TELEGRAPH INSTRUMENTS ON THE
LAKE SHORE ROAD.

In our issue of Oct. 3, we published the following from the *Detroit Free Press*:

"Colonel Wheaton, Superintendent of the Kalamazoo Division of the Michigan Southern Railway, has provided the train men with a new telegraph instrument, by which connection can be made with the main line at any place, and dispatches sent. The box is not large, but it affords room for train orders, stationery, one hundred feet of wire, etc. If a train breaks down all that is necessary is to make connections with the main wire, and orders can be sent or received at once."

In relation to this an officer of the road kindly corrects and enlarges the information as follows:

"Each division has been supplied lately with an instrument case, containing telegraph key, and box relay connected to posts in the outside of the case, to which wires can be instantly attached. The front of the case forms, when opened, the desk to write on, and there is a drawer for pencil and paper. This case is kept for the use of the telegrapher who accompanies a wrecking train, and enables communications to be established at once. That is all the foundation there is for this puff. Our Superintendent of Telegraph is the person to whom this sensible provision is due; and his modest name is William Kline, Jr."—*The Railway Gazette.*

TARIFF BUREAU. SEMI-MONTHLY CIRCULAR.

EXECUTIVE OFFICE,
WESTERN UNION TELEGRAPH COMPANY,
145 Broadway, New York, December 1, 1874.

To all offices on W. U. Lines:

The following changes and additions have been made since the date of the last circular:

GENERAL INFORMATION.

Argenta, Ark., re-opened; square 412.
Portersville, Cal., closed.
Disco, Ill., closed.
Iowa, Ill., closed. Messages will hereafter be mailed at Carman.
Roann, Ind., closed.
On and after December 7, Waterville, Kansas, will be in square 502 instead of 513.
Cheestertown, Md., closed.
Indian Orchard, Mass., is now a W. U. office, square 32; check Springfield.
West Warren, Mass., is now a W. U. office, square 32, check Warren.
Roberts' Landing, Mich., closed.
Billings, Mo., closed.
Edgar, Neb., closed.
Tecoma, Nev., reopened as a W. U. office.
Black Lands, N. B., closed.
Kingston, N. B., Mont. Co., re-opened.
Business for Englishtown, N. J., will hereafter be checked to Jamesburg.
Messages taken for Clinton, N. J., are delivered from Annandale; charges for delivery, 40 cents.
Business for North Branch and Three Bridges, N. J., will hereafter be checked direct.
North West, N. C., closed.
Big Run, O., closed.
Belpre, O., re-opened; "tariff for other lines" 30 and 2 from Marietta, or 50 and 3 from Chillicothe.
Frankfort, O., closed.
Raysville, O., closed.
Scott's Landing, O., closed.
Ridgeville, O., changed to Shawville.
Windsor, O., square 201 printed in the tariff book, is in Richmond Co. P. O. A. is West Windsor.
Baby's Point, Ont., closed.
Kilbride, Ontario, closed.
Sarnia, G. T. R., Ont., changed to Point Edouard.
Angora, Pa., closed.
Darby, Pa., re-opened; square 59.
Dillsburg, Pa., closed.
Sallsbury, Pa., re-opened; square 122.
Summit Hill, Carbon Co., Pa., closed. Messages are mailed or delivered by special messenger from Tamaqua. Charges for delivery, 75 cents.
Trexlerstown, Pa., is now an other line office; "tariff for other lines" 15 and 1 from Catasauqua.
Wellsport, Pa., is now a W. U. office, square 66; check direct.
The notice in last Journal referring to St. Paul's Bay, Que., should have read "St. Paul."
Berkshire, Vt., changed to West Berkshire.
Highgate Centre, Vt., is now an other line office. "Tariff for other lines" 35 and 3 from St. Johnsbury, or 25 and 3 from Swanton.

NEW OFFICES.

* Camp Verde, Arizona, 100 8 San Diego, Cal.
Plumas Eureka Mine, Cal.
Quincy, Cal.
557 Davidson, Col.
557 Morrison, Col.
* Arnold Station, Conn. 30 3 32 Hartford
* Millvue, Fla., 50 5 Pensacola.
22 Brimfield, Mass.; check Springfield.
270 Flowerfield, Mich.
260 Hopkins, Mich.
400 Pilot Grove, Mo.
* Franklin, Delaware Co., N. Y., { 65 5 45 Albany.
{ 60 5 65 Binghamton.
144 Polkton, N. C.
* Coolville, O., { 40 3 181 Marietta.
{ 50 3 213 Chillicothe.
151 Elliottsville, O.
* Forch, O., { 30 2 181 Marietta.
{ 50 3 213 Chillicothe.
221 Kansas, O.
221 Pettisville, O. (open at night only).
180 Shawville, O. (formerly Ridgeville).
* Stewart's, O., { 40 3 181 Marietta.
{ 50 3 213 Chillicothe.
* Warren's Junction, O., { 40 3 181 Marietta.
{ 50 3 213 Chillicothe.
{ 25 2 181 Athens.

* Webbs, O., 55 4 191 Mansfield.
* Hagersville Sta., Ont.
* Inwood, Ont.
* Point Edouard, Ont. (formerly Sarnia, G. T. R.)
* Rosellin, Ont.
* Teeterville, Ont.
* Thomasburg, Ont.

122 Berlin, Somerset Co., Pa.
156 George's Station, S. C.
136 Summerville, S. C.
122 Keyser, W. Va.; P. O., New Creek.
* West Berkshire, Vt., (formerly Berkshire), 30 2 30 Stanstead, Quebec, Mont. Co.

NOTICE TO OFFICES IN SQUARE 151.

The tariff from square 151 to squares 416, 417, 418, 419, 420 and 421 is \$1.25. Offices in square 151 whose square sheet shows no rate, or a different one from that above given, will make their rate \$1.25.

CUBA CABLE BUSINESS.

We are notified that the cable between Jamaica and Aspinwall is interrupted. Messages for Aspinwall and Panama will be posted from Jamaica on or about the 5th, 10th and 20th of each month. The words "Post Jamaica" must be inserted as part of the address, and paid for.

WILLIAM ORTON, President.

BORN.

HAWKINS.—At Franklin, Ind., Nov. 7, 1874, to Ed. A. Hawkins, Operator W. U. Tel. Office, Indianapolis, a son.

HUMPHREY.—At Aledo, Ill., Nov. 3, 1874, to E. C. Humphrey, Agent and Operator C. B. and Q. R. R., a daughter.

MARRIED.

FOGG—BLAKE.—At Plymouth, N. H., Nov. 14, 1874, by Rev. Geo. H. Scott, Mr. Jay A. Fogg, Operator Boston, Concord and Montreal R. R., to Miss Emma Blake, daughter of Nathan Blake, all of Plymouth.

DIED.

WILDRICK.—At Freemansburg, Pa., Nov. 15, 1874, of scarlet fever, Harry E., son of Frederick H. Wildrick, Agent and Operator C. R. R. of N. J., aged 8 years and 13 days.

OBITUARY.

ISAAC BUTTS.

Isaac Butts, a wealthy and prominent citizen of Rochester, N. Y., died in that city on Friday, Nov. 20th, after an illness of two weeks. Mr. Butts was formerly for many years editor of *The Rochester Union*, a prominent paper in the Western part of the State.

Mr. Butts was one of the first directors of the New York and Mississippi Valley Printing Telegraph Company, and took an active interest in its affairs. After that company became merged into the Western Union Telegraph Company, he became a director in the new organization, and for a number of years took an active part in its management.

Mr. Butts was born in Dutchess County, N. Y., and was at the time of his death in the fifty-ninth year of his age.

THOMAS McMANUS.

Died, at Bergen Point, N. J., November 17, 1874, of consumption, Thomas McManus, aged 28 years. Deceased for the past two years was employed by the Central R. R. Co., of N. J., in the capacity of telegraph operator, and his funeral was attended on the 18th, by a delegation of brother operators from Phillipsburgh, Somerville, Plainfield, Elizabeth, Bergen Point, Port Johnston, Pamrapo, and Jersey City. Deceased was a disabled soldier in the late civil war, and undoubtedly contracted the disease of which he died, while in the U. S. military service.

After the funeral, at a meeting of the committee appointed by the operators present, it was

Resolved, That the thanks of the Fraternity are due, and are hereby tendered to Miss E. J. Van Buekirk for her generous gift of a lot in the Cemetery, and for her kind and unremitting attention in nursing our deceased friend in his last sickness, when no relative or other friend was near.

THE TELEGRAPHERS' MUTUAL BENEFIT ASSOCIATION.

ASSESSMENTS 70 AND 71, ISSUED NOV. 30TH, 1874.

DEATH OF E. B. McDILL AND W. C. HAVENS.

E. B. McDILL, (Certificate No. 2235, issued April 7, 1874,) died at Rosedale, Ks., October 7, 1874. Mr. McDill fell between the cars of a train upon which he was traveling from Leavenworth to Rosedale, and was almost instantly killed.

W. C. HAVENS, (Certificate No. 133, issued Nov. 23, 1867,) died at Brooklyn, N. Y., October 29th, 1874, of Bright's disease of the kidneys.

Two dollars are due on above assessments from members whose certificates are numbered not above 2312; one dollar from those holding certificates between 2311 and 2340.

ACKNOWLEDGEMENT OF RECEIPTS FOR ASSESSMENTS UP TO AND INCLUDING NOV. 24, 1874.

ASSESSMENT No. 69.

8, 17, 22, 26, 31, 35, 60, 70, 74, 75, 84, 97, 99, 101, 103, 112, 114, 120, 126, 130, 141, 142, 144, 146, 153, 154, 156, 158, 160, 164, 171, 176, 177, 179, 183, 189, 190, 191, 193, 197, 198, 201, 202, 206, 218, 227, 228, 230, 240, 242, 253, 274, 276, 281, 316, 323, 323, 341, 344, 350, 353, 357, 360, 363, 364, 366, 371, 373, 379, 383, 392, 393, 394, 402, 405, 411, 412, 413, 418, 430, 431, 441, 456, 466, 468, 469, 470, 471, 475, 478, 484, 511, 512, 514, 516, 556, 557, 560, 565, 569, 573, 574, 576, 584, 586, 590, 605, 617, 618, 622, 642, 646, 648, 655, 662, 663, 664, 665, 667, 669, 690, 694, 701, 708, 710, 712, 717, 722, 723, 724, 726, 730, 732, 734, 736, 751, 756, 772, 780, 781, 782, 783, 785, 786, 787, 790, 801, 802, 808, 809, 812, 813, 820, 822, 831, 836, 838, 842, 848, 855, 870, 871, 874, 897, 901, 904, 905, 906, 926, 927, 930, 938, 939, 942, 943, 944, 949, 954, 957, 959, 963, 964, 976, 979, 980, 991, 992, 1000, 1002, 1005, 1014, 1016, 1023, 1030, 1031, 1033, 1034, 1040, 1041, 1042, 1050, 1057, 1058, 1063, 1069, 1080, 1085, 1099, 1100, 1101, 1102, 1108, 1109, 1107, 1108, 1109, 1110, 1112, 1113, 1115, 1117, 1119, 1120, 1123, 1122, 1125, 1126, 1141, 1152, 1164, 1190, 1191, 1198, 1194, 1196, 1210, 1211, 1217, 1291, 1292, 1297, 1293, 1294, 1297, 1298, 1299, 1340, 1341, 1342, 1351, 1355, 1356, 1363, 1369, 1370, 1374, 1375, 1376, 1381, 1382, 1384, 1385, 1386, 1388, 1389, 1390, 1394, 1395, 1397, 1399, 1311, 1312, 1313, 1314, 1315, 1317, 1318, 1319, 1320, 1321, 1322, 1323, 1329, 1330, 1340, 1342, 1344, 1346, 1348, 1349, 1350, 1351, 1352, 1353, 1354, 1355, 1356, 1358, 1362, 1372, 1375, 1376, 1385, 1389, 1390, 1391, 1405, 1406, 1412, 1415, 1417, 1421, 1426, 1427, 1428, 1430, 1432, 1433, 1438, 1440, 1444, 1445, 1449, 1451, 1454, 1455, 1456, 1457, 1458, 1465, 1469, 1471, 1474, 1476, 1481, 1482, 1485, 1490, 1497, 1498, 15 0, 1501, 1503, 1505, 1506, 1508, 1511, 1513, 1515, 1522, 1523, 1529, 1530, 1537, 1542, 1546, 1555, 1558, 1562, 1569, 1572, 1573, 1580, 1582, 1586, 1593, 1594, 1596, 1597, 1616, 1630, 1632, 1640, 1652, 1656, 1660, 1661, 1662, 1663, 1665, 1666, 1667, 1672, 1673, 1676, 1681, 1684, 1687, 1688, 1696, 1697, 1698, 1699, 1700, 1701, 1702, 1704, 1707, 1709, 1710, 1712, 1714, 1718, 1721, 1723, 1724, 1725, 1728, 1729, 1747, 1747, 1750, 1751, 1752, 1754, 1755, 1756, 1757, 1758, 1759, 1760, 1765, 1766, 1767, 1769, 1771, 1772, 1775, 1785, 1789, 1790, 1791, 1795, 1796, 1797, 1802, 1804, 1810, 1812, 1813, 1818, 1822, 1824, 1828, 1830, 1837, 1838, 1839, 1840, 1841, 1844, 1845, 1847, 1852, 1857, 1858, 1859, 1860, 1863, 1864, 1876, 1877, 1889, 1893, 1896, 1908, 1917, 1928, 1942, 1943, 1953, 1954, 1967, 1968, 1969, 1972, 1973, 1986, 1991, 1992, 1993, 1998, 1999, 2004, 2005, 2007, 2010, 2012, 2022, 2023, 2024, 2025, 2026, 2040, 2041, 2044, 2050, 2052, 2061, 2065, 2069, 2072, 2074, 2075, 2083, 2084, 2085, 2086, 2089, 2127, 2092, 2094, 2108, 2110, 2112, 2114, 2119, 2120, 2122, 2126, 2131, 2134, 2136, 2142, 2148, 2149, 2154, 2156, 2157, 2159, 2160, 2164, 2165, 2167, 2168, 2171, 2179, 2180, 2183, 2184, 2185, 2187, 2196, 2200, 2201, 2202, 2210, 2211, 2212, 2215, 2217, 2220, 2221, 2226, 2228, 2229, 2230, 2231, 2232, 2233, 2234, 2242, 2243, 2245, 2246, 2260, 2262, 2264, 2265, 2266, 2267, 2268, 2285, 2286, 2288, 2289, 2292, 2293, 2301.

ASSESSMENT No. 68.

27, 222, 227, 228, 242, 246, 258, 268, 451, 453, 455, 457, 804, 1108, 1153, 1294, 1450, 1673, 1715, 1716, 1731, 1732, 1736, 1841, 1974, 1975, 1976, 2027, 2061, 2177, 2198.

Members of the Association who look to the JOURNAL OF THE TELEGRAPH for receipt of assessments paid, will please take notice, that an acknowledgment of the receipt of one assessment should be taken as a receipt for all previous assessments.

THE TELEGRAPHS OF THE ARGENTINE REPUBLIC.

From the official report of the telegraphs of the Argentine Republic by the Director-General, Mr. Charles Burton, we gather the following :

The Government telegraph system dates from the year 1870. In that year 129 miles of line were erected, and this has year by year gone on increasing until it now reaches 2,818 miles of line, carrying a total mileage of wire of 5,218 miles. Siemen's iron posts are employed on 1,448 miles ; wooden poles of the country, in their natural state, have been made use of on the remaining 1,170 miles. In addition, however, to this, there are various private undertakings, which have either been "subventioned" by the National Government, or belonging to the various railway companies in the State. These, including a two wire line of 82 miles (belonging to the River Plate Telegraph Company), have 1,528 miles of line, carrying 2,841 miles of wire, which, added to the purely national telegraphs, give a grand total for the Argentine Republic of 4,146 miles of line, and 8,059 miles of wire.

These lines have been erected by private contractors, at a cost ranging from 500 "hard" * dollars per mile for lines with iron posts, to 384 "hard" dollars per mile for those with wooden poles.

The national lines are maintained by the Government with a staff at present of one director-general, one mechanic, three inspectors, six "line repairers," and fifty-seven linemen. The latter seem to be but poorly paid ; their actual salary is forty hard dollars per month, "with which (we quote the words of the report), they have to buy and maintain a sufficient number of horses, pay their extra expenses when they are out, besides rent and ordinary cost of living at the point where the office is situated, and where they must fix their residence."

Mr. Burton on this subject pertinently remarks, "It is false economy to allow a practical lineman accustomed to the specialties of his section, and acquainted with the nature of the ground in which it is situated, to leave the service, instead of giving him a salary with which he could satisfy the ordinary necessities of life."

The Morse instrument is universally employed throughout, and the alphabetical signs are those adopted by the European International Convention, with the exception that — — — is used for ll, a combination of frequent occurrence in all the dialects of the Spanish language.

The instrument is not, however, equal to the pressure which from time to time suddenly arises on the trunk lines, and some other system must be introduced to augment the rate of working of the ordinary Morse. The only instrument which has hitherto been tried in addition to the Morse is the Hughes, which, as one would naturally expect, has failed to accomplish the end in view. Without special instruction in its management, and perfect familiarity with all the mechanical details, Hughes's apparatus cannot be considered in any way superior to the Morse for the despatch of traffic. Mr. Burton accordingly urges upon the Government the necessity which exists for his proceeding either to England or the United States, and personally inspecting the improvements which have been made in the transmitting apparatus of these countries during the last five years. We doubt not that the wants which are felt could easily be satisfied. The introduction of duplex work-

ing, or the establishment of an automatic system on the trunk lines, would, we are sure, do all that for several years to come could possibly be required of them.

There are in all sixty offices, which are manned by a staff of 114 telegraphers (including clerks in charge), five counter clerks, and sixty-seven messengers. At the great majority of these only one instrument is fixed. Rosario can boast of seven. They are kept open to the public up to 4.30 P. M., although telegrams proceeding from other lines, or from the press, are received up to 7 P. M. Government telegrams are of course received at any hour when there are clerks at the offices.

The qualifications for the appointments of telegraphers are good penmanship and a perfect knowledge of orthography. The minimum age at which they are admitted is eighteen years—might with advantage be reduced ; the mechanical art of telegraphing does not require the mental powers to be matured ; a healthy lad commencing at, say, from fourteen to sixteen, will, when he has reached the age of eighteen, be found, if at any period of his career, an expert manipulator.

We are glad to observe that, as in the postal telegraph department of England, an outlet is afforded in this direction for the employment of female labor. The first female telegrapher, we read, was appointed to the service on January 1, 1873, but since then no addition to the number has been made. This, however, must not be attributed to any idea as to the inaptitude of female labor for telegraphy ; Mr. Burton is, on the contrary, convinced that the reverse is the case ; yet, although several competent clerks have presented themselves, the difficulty of procuring vacancies in the towns where the necessary conveniences and security could be found, has prevented them from receiving appointments. The telegraphers appear to have been at first trained in the large offices, but the practice has been discontinued at the two largest—Rosario and Panama—"on account of the many errors which were incurred in the retransmission of telegrams being chiefly committed by learners who were not sufficiently competent." They are now educated either at the school of instruction which has been instituted at Buenos Ayres, or they are placed at one of the minor stations in the interior.

A uniform tariff is adopted betwixt all the National Telegraph offices, and is at present 25 cents (about 1s. 0½d.) for every ten words, not including the address, and signature, which are sent free ; each figure is counted as a word. For press messages 25 cents are charged for the first twenty-five words, and 1 cent for each succeeding word. It is now proposed to abandon this tariff, and adopt in its place the system of the International Convention. Should this be carried out the minimum charge will then be 40 cents (about 1s. 8d.) for any number of words up to twenty, including the addresses and signature ; 20 cents for every succeeding ten words ; each group of figures up to five to be considered as one word.

During the first three years—1870, 1871, and 1872—the traffic went on rapidly increasing ; but in 1873 there was a marked decrease in the number of messages, although the actual value was considerably over that of those dealt with in 1872.

The following returns show the progress of the telegraphs from the commencement :—

Year.	No. of Telegrams.	Value in Hard Dollars.	Total Cost of Maintenance.
1870.....	6,440	1,511.05	14,538
1871.....	61,429	31,490.78	81,361
1872.....	181,778	78,580.07	111,348
1873.....	170,888	81,897.80	108,970

* The hard dollar (peso fuerte) is worth about 4s. 2d., and should not be confounded with the paper dollar (moneda corriente) which is only worth 2d. The former is always used in national and the latter in provincial accounts.

This falling off is accounted for, first, by the destruction of the telegraph lines through inundations in the Northern provinces ; and secondly, by the Rebellion which broke out in the beginning of May in the province of Entre Rios, and continued until the close of the year. The natural consequence was, that although the number and value of private messages decreased, yet those sent upon Government business were considerably in excess of the previous year. The following comparison of private telegrams with official during the years 1872 and 1873 is interesting :

Year.		Value in Hard Dollars.
1872.	Private.....	166,808
"	Official.....	14,971
1873.	Private.....	150,434
"	Official.....	20,399

From the figures which are published above, it will be seen that the receipts from private telegrams by no means cover the expense of maintaining the service, and this it is which has mainly led to the contemplated revision of the tariff already alluded to.

An interesting section of the Report is occupied with a narrative of the difficulties which the Staff had to contend with during the year 1873 ; the Rebellion in Entre Rios "left behind it about 700 miles of line in the most deplorable condition." During the war, also, large sections of the wire were stolen, on account of its intrinsic value, by the neighbors to the line, and used for fences or other domestic purposes.

Great difficulty was experienced frequently in securing the delivery of telegrams to the National army. In one town, occupied by the rebels, a clerk resided in the telegraph office, and the other *employés* being prohibited entrance, a lady—who was made aware of the circumstances—entered the office, and, by secreting the telegrams in her dress, succeeded in delivering them.

The working of the lines is frequently interrupted by faults, in many instances ingeniously devised, evidently by those acquainted with the science, in others apparently prompted by pure mischief. Upon one occasion, for instance, "a wire was totally disconnected betwixt Rosario and Cordoba. The linemen examined the section several times without succeeding in detecting the fault, until finally it was discovered that a portion of the wire had been cut out and replaced by a curtain cord of the same gauge, and painted so as to resemble in appearance, as closely as possible, the line wire. Guitar strings are frequently placed so as to connect the wires with the iron posts, at points where they can with difficulty be seen from the road. In one instance one of these guitar strings had been employed to bring two wires, running upon the same line of poles, into contact with each other, and was then covered over with a piece of raw hide in such a manner that the linemen, knowing that the hide alone could not cause the fault, passed and repassed the place without suspecting what was wrong."

The assistance which the telegraphs of the Argentine Republic have rendered to the Government can not well be overestimated. The value in stamping out rebellions, and preventing the needless effusion of blood, is acknowledged, and one may be permitted to indulge the hope that, when the enormous power which they wield comes to be more generally recognized, they will prove a still more valuable ally to the cause of order, and become one of the most powerful agents in effectually putting an end to the anarchy to which this vast and rich country has been so long a prey.—*Telegraphic Journal.*

Journal of the Telegraph.

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Address—

JOURNAL OF THE TELEGRAPH,
Western Union Telegraph Company,
145 Broadway, New York.

NEW YORK, DECEMBER 1, 1874.

We are happy to announce that Mr. De Bree, cable manager of the International Ocean Telegraph Company, has repaired the fault in the 1871 cable between Key West and Punta Rasa, and that communication is again restored between the United States and the West Indies.

We publish in our present issue two solutions of the problem presented by Mr. Brown. In our next issue we shall give Kirchhoff's Laws, by means of which every problem relating to the ramifications of electric currents can be solved.

The report of the Treasurer of the Telegraphers' Mutual Benefit Association, rendered at the recent annual meeting, states that the reserve fund of the Association, on hand, after meeting an assessment during the year of \$1,000, amounts to \$3,425.98. To this is to be added the accrued interest on that sum from July to November, which will swell the total to about \$3,700.

This is a respectable showing, and the best evidence possible of skillful and economical management. A strong reserve fund will give stability to the Association and confidence to the assured.

No assessment is to be paid from this fund during the ensuing year, unless the accumulation amounts to \$6,000, to leave \$5,000 on hand. For the year next following, the restriction is increased to \$8,500, leaving \$7,500, and thereafter the fund is to be maintained at \$10,000.

As we had supposed, from the long interval of silence, another mishap has occurred in the laying of the Direct United States Cable. It will be remembered that on Nov. 8th, when within 200 miles of the American coast, the *Faraday* was obliged to cut and buoy the cable. For two weeks thereafter nothing further was heard from the expedition beyond the fact that owing to stress of weather the fleet had put in at Harbor Grace, Newfoundland. It now appears, by a dispatch from London on Nov. 25th, that the cable had again been recovered, but owing to unfavorable weather no progress was possible, and the cable would again be buoyed.

THE LEASE OF THE FRANKLIN LINES.

According to the accounts published in the Boston papers of the meeting of the stockholders of the Franklin Telegraph Company in that city, at which that line was leased to the Atlantic and Pacific Company for ninety-nine years, at an annual rental of \$27,500, very bad feeling was exhibited, and many acrimonious remarks were passed. Of course, owning a majority of the stock of the Franklin Company, the managers of the Atlantic and Pacific Company could dictate any policy they pleased to the unfortunate minority, and this they did in leasing to themselves at \$27,500 that for which other parties were willing to pay a much greater sum.

The inside history of this transaction being somewhat instructive, and as the JOURNAL is in a position to lay all of the facts attending this brilliant scheme before the public, we feel assured that the account will be read with general interest.

When it became known that a majority of the Franklin stock could be had, an understanding was arrived at between the Atlantic and Pacific Company and the Southern and Atlantic Company, that the stock should be acquired and the lines leased for a sum not to exceed \$36,000 per year, the Atlantic and Pacific Company to take the lines from New York eastward, and the other party the lines south, the negotiation to be conducted by the Atlantic and Pacific Company.

This partition of the Franklin lines would render the Southern and Atlantic Company completely independent, so far as the New York connection could make them, while the preservation of these lines in their entirety, in the hands of the Atlantic and Pacific Company, would give the latter the control of the situation. The stake was a great one to both, but as neither wished to risk defeat and neither probably having sufficient surplus cash from their earnings to raise a bid upon the other, the forces were combined and the above mentioned arrangement arrived at.

Accordingly the stock was purchased, but the agreement was not carried out, as the purchasers, the managers of the Atlantic and Pacific Company, claimed that they had acted in a private capacity, and not as officers or trustees of the Company, and the Company could not control their action.

By this proceeding the outwitted party of the second part is still without a connection of their own between New York and Washington, with no present prospect of obtaining one, and the stockholders of the Franklin Company are apparently minus a very considerable sum of money yearly.

The public will undoubtedly be at a loss for fitting words with which to express admiration at the adroit tactics displayed by the winning party. It will now understand how the transactions of a corporation can be conducted as the individual business enterprises of its managers; also, how the same transactions can afterward be transferred by the same managers to the corporation.

We, however, cannot help expressing surprise that the minority at the meeting should have lost their good humor and laid politeness aside. The success of this shrewd operation should have extorted their admiration and applause. What mattered it that this lease affected their pockets disastrously. It was a good joke on them, as well as a remarkable instance of successful strategy. But some people despise strategy and fail to appreciate jokes, particularly when they are of a practical nature and at their own expense.

One of the stockholders, more irate than his fellows, so far forgot what was due to the occasion and to his own dignity, as to threaten to throw the matter of the lease into the Courts. The public will discern a silver lining to even this dark cloud, for, should he carry his threat into effect, besides what they have already learned concerning the very nice distinctions possible to be made between the business transactions of corporations and those of their managers, there will be a possibility of finding out in what manner the Atlantic and Pacific Company hoped to acquire "lateral lines without expense," which the last annual report of their Executive Manager, incorporated into the annual report of the President, stated that they could "generally" do.

THE CANADIAN TELEGRAPHS ACT.

From the following official decision, which we find in late English papers, it appears that the Home Government refuses its sanction to the Telegraphs bill lately passed by the Dominion Parliament, and refers the same back for further consideration. The bill in question was hurriedly passed through the two Houses of the Canadian Parliament in a manner certainly open to a suspicion of dishonest motives, the object being to bring such an amount of pressure to bear on the Anglo-American Company as to force them to waive the exclusive privileges they enjoy of landing cables on the coast of Newfoundland. It virtually confiscated all the rights and property owned by that Company in the province. By this decision the bill has no legal force, and becomes abortive. We trust that a reconsideration of this measure by the Canadian Parliament will result in a better understanding of its real character, and that this understanding will be followed by its consignment to the sleep which knows no awakening.

"DOWNING STREET, NOV. 10.

"SIR: With reference to previous correspondence with regard to the reserved bill of the Canadian Parliament 'to regulate the construction and maintenance of marine electric telegraphs,' I am directed by the Earl of Carnarvon to inform you that, after a careful consideration of all the very peculiar circumstances of the case, he has arrived at the conclusion to tender no advice to her Majesty upon the present bill. Legislation on this subject being, in Lord Carnarvon's opinion, strictly within the competency of the Dominion Parliament, the fact that this measure has been for certain special reasons reserved does not appear to his lordship to be sufficient ground for his doing more than leaving it in abeyance, with a view to a further examination of the whole subject in Canada, which he has recom-

mended. Lord Carnarvon had already announced this decision to the Governor-General of Canada and to the Governor of Newfoundland.—I am, sir, your most obedient servant,

"ROBERT G. W. HERBERT.

"TO THE SECRETARY OF THE ANGLO-AMERICAN TELEGRAPH COMPANY."

THE REPORT OF THE POSTMASTER-GENERAL.

It is with a happy sense of relief that we read the first annual report of Postmaster-General Jewell. As compared with the official reports of his predecessor for six years past, the present is a very remarkable document. At last we have in that high position a man who understands the real duties of his office, and who proposes to conduct the business of the Department on business principles, without interfering with the right of private enterprise. Hitherto it has seemed to be the theory of the office that it should absorb or supplant any successful undertaking of private citizens which at all resembled its own. But Mr. Jewell appears to have no desire to increase by outside speculation the yearly deficit of \$8,000,000 which is staring him in the face, but is rather going to do his best to make the receipts and expenditures of his Department bear some proper relation. This is as it should be, and in carrying out this and other reforms which he has initiated, Mr. Jewell can rely upon the support of the whole country, and we hope that his success in this direction will be as great as he seems to desire.

The Telegraph Companies will now rest awhile, secure from threatened Governmental spoliation, and the public will no longer dread the incubus of increased taxation which would surely follow the absorption of the telegraphs by the Government.

THE NEW DEPARTURE IN AUTOMATIC TELEGRAPHY.

We are in receipt of a pamphlet of some thirty odd pages, announcing the commencement of a suit in the Superior Court of the City of New York, by Mr. Daniel H. Craig, against Mr. George Harrington and others, and the Automatic and National Telegraph Companies.

The complaint charges a great number of failures on the part of the defendants to fulfill their obligations, the merits of which we are unable to determine; but the pungent inquiry propounded by Mr. Harrington to Mr. Craig: "Is there not a tendency to degenerate into a division over the spoils, before we have any spoils?"—we think every one conversant with the history of Automatic Telegraphy during the past five years will fully appreciate. If all the parties interested in Automatic Telegraphy wait for a division of the spoils until they get some to divide, we are afraid their several shares will be a long time in coming, but we really cannot see any other course open to them. In the meantime, although Automatic Telegraphy bids fair to result, in the future as in the past, in utter failure to the investors in the enterprise, there

seems to be no doubt about its beneficial results to the legal gentlemen who will be employed in prosecuting and defending the various suits, which its litigious promoters are now about to indulge in.

THE TELEGRAPHERS' MUTUAL BENEFIT ASSOCIATION.

A TIMELY GIFT.

We have the assurance from various intelligent sources that the generous action of the recent annual meeting of the Telegraphers' Mutual Benefit Association has been productive of general and hearty satisfaction. It now stands in an attitude to all, so simple and easy and unoppressive, that justice and generosity shake hands, and the benevolent design is not overshadowed by the official conditions. This is a very happy result, and we augur for the Association a future of more hearty appreciation and usefulness. Grounded as it is in one of the finest instincts of the heart of all noble-minded men, which with affectionate prescience anticipates the period when death shall still the providing hand, and from the very grave provides for the bereaved and desolate, the Association is one of the happy tokens of civilization and character connected with pursuits so eminently dependent on high honor and reproachless integrity. It is more than an insurance society. It is a bond of fellowship. It begets brotherhood in ordinary toil. It excites manliness. It is one of the best factors in an enterprise where success is so dependent on virtue.

It is not, therefore, with surprise, yet with grateful gladness, that we find the Executive Officers of the Western Union Telegraph Company acknowledging the value of the Telegraphers' Mutual Benefit Association as worthy of its notice and support, and testifying thereto by the handsome gift recorded in the following correspondence. We believe that money was never more worthily bestowed, or will be more happily remunerative to its donors. In the vast domain over which the executive control of a great company has to stretch out its hands in vigorous and intelligent direction, no better or surer aid can be found than in the encouragement of all those elements of fidelity which have their root and growth in the generousities and affections which bind men together in the performance of the great duties of life.

EXECUTIVE OFFICE,
WESTERN UNION TELEGRAPH COMPANY,
New York, November 21, 1874.
JAMES D. REID, Esq.,
Treasurer, &c.

DEAR SIR: I regret that I was unable to attend the annual meeting of the Telegraphers' Mutual Benefit Association, and I hope my absence was not construed as indicating indifference on my part to the objects of the Association. I have read the published account of the proceedings, and have also conversed with some of those who attended the meeting, and I take the liberty to say that I cordially approve all that was done.

And now, in testimony of my desire to increase the usefulness of the Association by encouraging present members to continue the good work, and others to come to their assistance, I have the pleas-

ure to contribute to the reserve fund of the Association the sum of one thousand dollars, which has been placed at my disposal by the unanimous vote of the Executive Committee.

I am, very respectfully, &c.,

WILLIAM ORTON,

President.

New York, November 23, 1874.

HON. WILLIAM ORTON,

President.

DEAR SIR: I am desired by the Executive Committee of the Telegraphers' Mutual Benefit Association to express to you their gratitude for the munificent gift of one thousand dollars tendered by you on behalf of the Western Union Telegraph Company, as an addition to the reserve fund of the Association, as well as for the encouraging words which accompanied its presentation. It will, I am sure, gratify you and all interested to know that this timely and generous donation has permitted us at once to make an investment of five thousand dollars of reserved funds, by purchase of first-class seven per cent. bonds of that amount, paying interest semi-annually. We are thus enabled to do on the threshold of the year what we only contemplated ability to do at its close.

Please accept all our thanks for this new testimony of your hearty sympathy with those who serve you.

Very respectfully,

JAMES D. REID,

Treasurer.

By this timely and munificent gift the Executive Committee were enabled to fund five thousand dollars in solid seven per cent. bonds as the Reserve Fund of the Association. We extend to the Association our heartiest congratulations and wish it abundant success in its great and honorable work.

MESSENGERS PARADE AND FESTIVAL.

The Messengers of the American District Telegraph Company paraded on the morning of Thanksgiving Day in front of the City Hall, when they were reviewed by the President of the Company, Mr. E. L. Andrews. At this point there was a drill and marching match, the prize for which was awarded to the Company of the Twenty-eighth District. The boys then marched to Fulton Ferry, and, arriving at Brooklyn, they took the cars to Myrtle Avenue Park. Here they competed for prizes in foot and sack races and target shooting. The prizes were vacations of from one day to one week with pay, and in some cases silver medals were also awarded. The first prize in the first foot race was won by John Horan of the Thirty-first District. The first prize in the sack race, which afforded a great deal of merriment to the boys, was won by Weiss, No. 282. The shooting match followed, but as the judges were unable to ascertain the points scored by each contestant before the party left the park no decision was made. The distance was 140 feet, position standing, two rounds being allowed each boy. One boy made two bull's-eyes, but one shot was protested, the boy having rested his arm in taking aim. A plentiful dinner was prepared for them, and they enjoyed it heartily. After the festivities the boys walked back to the ferry and returned to the city.

A HUSBAND'S MESSAGE.—A Kalamazoo judge went to a neighboring town to see a man, and telegraphed back to his wife, "Have found Garland; won't be home in a week." When the dispatch reached her it read, "Have found girl, and won't be home in a week." Here let us draw a veil.

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6 " " " "	2.00
8 " " " "	2.50

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Send in your Orders.

**FRANK K. SMITH,
Bangor, Maine.**

CHAMPION

Burglar Alarm & Annunciator Company,
40 West 18th St., New York.



We invite Telegraph Managers and Operators throughout the country to act as our Agents for the introduction of our Superior Burglar Alarms and Annunciators into Private Houses, Hotels, Banks, &c.

Upon receipt of plans of houses, we will send skillful mechanics to estimate upon work or will give any information in writing that may be required. *Liberal commissions will be paid upon any orders that may be secured for us.*

Our Alarms and Annunciators have just been awarded the First Premium of the American Institute.

Explanatory Circulars will be furnished upon application to the Secretary.

L. G. TILLOTSON,
President.

CORNELIUS ROOSEVELT,
Sec'y and Treas.,
40 West 18th Street, N. Y.

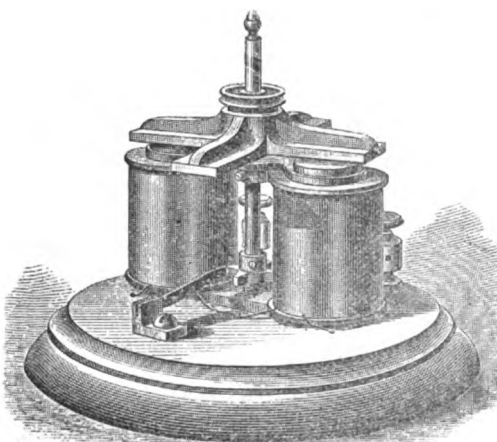
CALIFORNIA AGENCY FOR

Partrick, Bunnell & Co's Instruments.
NEW PERFECTED GIANT SOUNDERS,
IMPROVED CURVED KEYS, LATEST AND BEST,
Champion Learners' Instruments, Splendid New Pocket
Relays, and Regular Relays.

Address

GEO. M. POMEROY, San Jose, Cal.

SOMETHING NEW!



[PATENTED SEPT. 29, 1874.]

THE FAIRY ELECTRIC ENGINE.

A perfect working model of an engine **Run by Electricity!**
It will work well with an ordinary local battery.

Price, with two cells Eagles' Metallic Battery.....\$6 00
" without Battery..... 4 00

FOR SALE BY

THE ELECTRO-MAGNETIC M'FG CO.,
36 Broad St.,

P. O. Box 1804.

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ALSO BY

F. L. POPE & CO, 88 Vesey St.
L. G. TILLOTSON & CO, 8 Day St.

SMITH'S

GLASS CARDS,

Red, Blue, Green, White, Yellow and Purple.

CLEAR AND TRANSPARENT.

OVER 800,000 SOLD.

READ! READ!!

WHAT THE AGENTS HAVE DONE

We here publish a few of the many testimonials we have received, voluntarily, from our numerous agents.

These are all **GENUINE** letters, not highly colored or written for the occasion.

EXTRACTS FROM LETTERS.

HOLYOKE, MASS., May 18, 1874.
Mr. Smith, Dear Sir,—Enclosed find P. O. Order for amount of the within order for 72 doz. of your handsome Cards, and 10 Card Cases; the last 53 doz. gave perfect satisfaction. Please send these as soon as possible, as I have a large order waiting. This is my 10th order.
Yours truly,
J. W. McCABER.

A Telegraph Operator in Kennebec County, Maine, has sent 24 different orders which have paid him about \$3 apiece; all done in his leisure time without leaving his office to canvass.

NORTHVILLE, WAYNE CO., MICHIGAN, Jan. 28, 1874.
Enclosed find my first order, it is for 45 dozen of your handsome Cards; I was only 5 hours in selling this lot, which paid me \$6.25. I expect to send for \$50 worth next time. Please fill orders immediately.
JAMES McLOGAN.

Since the above; he took 100 orders for the next lot and is still doing well.

A telegraph operator's little girl only ten years old, in White Pine Co., Nevada, took \$10 worth of orders from a sample that got damaged by water in the mail, which I consider pretty good for the first trial.

An operator on the Illinois Central R. R. has sent 19 different orders, which contained the names of nearly all the Conductors and Brakemen on the line. He is still sending them in rapidly and says he thinks them beautiful.

COSHOCOTON, OHIO, July 31, '74.
Frank K. Smith, Bangor, Me., Dear Sir: My cards are received and are just what I want. I have had the cards but three hours, and have sold 10 packs and 5 card cases. I think I shall have a pretty good trade for them. Enclosed find P. O. order for them, less my commission. Please send me 100 circulars. I think I can make \$25 a day.
Yours truly,
J. M. DENNING.

Since then he has sent many large orders.
The Manager of a W. U. Office, in Vermont, has sent in several large orders, and says "they go like hot cakes on a cold morning."

The wife of a night operator in Mower Co., Minn., has sold nearly \$100 worth, and says she likes the business very much, it is so easy and gives her plenty of exercise in the open air, while it pays better and is pleasanter than sewing.

An operator in a small town in British Columbia, of 20 inhabitants, has sent orders for 16 of them. "How high is that?"

An operator in Toronto, Canada, has sent orders for over 100 packs, and still is rushing things.

I have just appointed an operator sole agent in one of the largest cities of the Canadas, and his first order was a stunner; he takes the lead of all my agents. Canada and the provinces are my best fields for agents. I have a smart agent in Halifax, also a lively one in Quebec; in fact they sell everywhere.

PHILIPS ACADEMY, ANDOVER, MASS., Jan. 6, 1874.
Frank K. Smith, Printer, Dear Sir: Your Glass Cards are really the most novel, the handsomest and most attractive affairs I ever saw. Wherever your Cards become known they will become very popular on account of their attractiveness; for while the ordinary paper cards are useful because they supply a necessity, yours are valued because in them you have wedded utility to beauty—a union much to be desired. Your success in effecting which, will give birth to the unaffected praise of an appreciative public, and the patronage of thousands of ladies and gentlemen of taste.
Respectfully,
M. A. LEWIS.

A messenger boy in Berks Co., Pa., sent his quarter and said he would show me what a messenger boy could do, and he did do nobly, and as well as the best of them.

The widow of an operator in San Francisco has taken many orders for me, and thinks soon of devoting her whole time to the business.

OPERATORS! ATTENTION!!

I find that the telegraph operators of America make the best agents for this business, and through them I wish to establish an agency in every town on this continent. Samples will be promptly furnished free to all who apply, and outfit for 25 cts., which is just half their cost. Now is just the time to get hosts of orders for the Holidays and New Year.

Full particulars in regard to agencies, and all other information promptly furnished on application to

**FRANK K. SMITH,
Bangor, Maine.**

JOURNAL OF THE TELEGRAPH.

VOL. VII. NO. 24.

NEW YORK, DECEMBER 15, 1874.

WHOLE NO. 171.

DIVIDING OF THE CURRENTS INTO BRANCH CURRENTS.

(Translated from Schellen's Elektromagnetische Telegraph.)

When a wire at a point A is forked in two or more branches, which are afterwards united again at a point B, as is represented in Fig. 1, the current is divided into just as many parts as there are branches. If the single branches are of equal length, and of the same material, the effect will be the same as if there was only one branch of the same length, whose cross-section is equal to the total of the cross-section of the single branch. The quantity of electricity circulating through a branch is then obviously in proportion to the total electricity circulating, as the cross-section of this branch is to the total of the cross-section of all the branches.

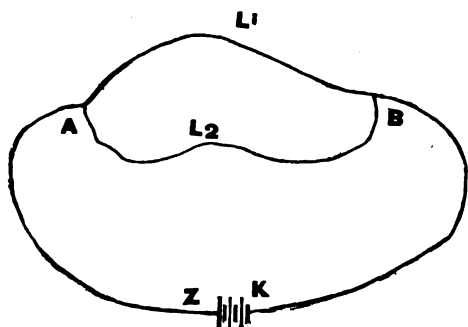


Figure 1.

Suppose now l_1 and l_2 be the reduced lengths of both lines which fork at A and B. Instead of these unequally long normal wires of 1 millimeter (0.03937) cross-section, suppose they were of equal length; then it is obvious that these new wires, in order to retain the same conductivity, or to offer the same resistance, must have smaller cross-sections in the same proportion, as they are shorter; for, when a wire is six times shorter, and at the same time six times smaller in cross-section, its resistance remains the same.

For the sake of simplicity let us take, instead of the lengths l_1 and l_2 , wires of length 1, whilst we make them shorter relatively to l_1 and l_2 ; when then its resistances remain the same, its cross-sections must of course be smaller in the same proportion,

$$\text{and be } \frac{1}{l_1} \text{ and } \frac{1}{l_2}.$$

As now the two branches, l_1 and l_2 , running next to each other, taken together, are equivalent in relation to conduction of current to a single line, which possesses the same material capacity and the same length 1, but a cross-section equal to the total of its cross-section, we can use instead of it a single wire, which has the length 1 and the cross-section

$$\frac{1}{l_1} + \frac{1}{l_2} = \frac{1}{l_1 + l_2}, \text{ or also a wire, which, like the}$$

normal wire, has a cross-section 1, and whose length is

$$\frac{l_1 l_2}{l_1 + l_2}.$$

The last expression then is the reduced length, or the reduced resistance of both branch wires l_1 and l_2 together; it represents the length of a single normal wire of 1 millimeter cross-section, which can be used instead of both branches l_1 and l_2 .

When between A and B still a third wire is stretched, whose reduced length was l_3 , for the same reason the three branches would give the same resistance as a single wire of length 1 and cross-section

$$\left(\frac{1}{l_1} + \frac{1}{l_2} + \frac{1}{l_3} \right) = \frac{l_1 l_2 + l_1 l_3 + l_2 l_3}{l_1 l_2 l_3}$$

or as a single wire of cross-section 1, and length

$$\frac{l_1 l_2 + l_1 l_3 + l_2 l_3}{l_1 l_2 l_3}$$

In order to find the strength of current in the undivided wire A Z or B K, as well in the branches between A and B, suppose the electromotive power of chain Z K be E , its resistance and that of the undivided closing arc A Z K B be w ; then the strength of current S is

$$\text{in A Z and B K } \dots S = \frac{E}{w + \frac{l_1 l_2}{l_1 + l_2}}$$

In A l_1 B and A l_2 B is evidently the total of the strength of current S . The single branches, however, may, as is shown, be replaced by wires of length 1 and cross-sections $\frac{1}{l_1}$ and $\frac{1}{l_2}$ both together by a wire of the length 1 and the cross-section $\frac{1}{l_1} + \frac{1}{l_2}$. Now the whole of the electricity circulating in Z A which passes likewise through both branches l_1 and l_2 , becomes divided on A l_1 B and A l_2 B in such a manner, that one branch of two or three double cross-sections also conducts two or three times as much electricity, and thus the branch with two or three times greater cross-section obtains also a strength of current two or three times as great.

Hence, when we indicate, as heretofore, by S the total of current strength in A Z K B by S_1 and S_2 , the strength of current relatively in l_1 and l_2 , then is

$$S_1 : S = \frac{1}{l_1} : \frac{1}{l_1} + \frac{1}{l_2},$$

$$\text{or } S_1 : S = \frac{1}{l_1} : \frac{l_1 + l_2}{l_1 l_2},$$

$$\text{or } S_1 : S = \frac{l_2}{l_1} : \frac{l_1 + l_2}{l_1},$$

$$\text{thus } S_1 = S \cdot \frac{l_2}{l_1 + l_2},$$

$$\text{also } S_2 = S \cdot \frac{l_1}{l_1 + l_2}$$

from which follows $S_1 : S_2 = l_2 : l_1$, that is to say,

the strengths of current in two branches are in inverse proportion to the reduced lengths or the resistances of these branches; or, what is the same thing, the dividing of a current into branches, which are located between two points, always follows in the same proportion as the conductivity of these branches.

The strength of current S in the undivided wire we have already found, viz:—

$$S = \frac{E}{w + \frac{l_1 l_2}{l_1 + l_2}} = \frac{E (l_1 + l_2)}{w l_1 + w l_2 + l_1 l_2}$$

When we put this value in the latter two equations instead of S , then, after reduction is made:

$$S_1 = \frac{E l_2}{w l_1 + w l_2 + l_1 l_2}$$

$$S_2 = \frac{E l_1}{w l_1 + w l_2 + l_1 l_2}$$

What has been said heretofore of two branches, of course can be applied immediately on several branches situated between the same two points; for instance, in applying corresponding notings we obtain in three branches for strength of current, S , in branch l_1 ,

$$S_1 : S = \frac{1}{l_1} : \frac{1}{l_1} + \frac{1}{l_2} + \frac{1}{l_3}$$

$$\text{and hence } S_1 = S \cdot \frac{l_2 l_3}{l_1 l_2 + l_1 l_3 + l_2 l_3}$$

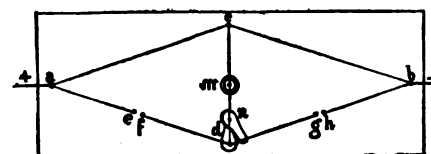


Figure 2.

Wheatstone's Bridge gives an example of a peculiar distribution of the current. It served at first the purpose of definition of small resistances, to wit: when the resistance is still very considerable in the chain in which, for the definition of a resistance, the galvanometer is inserted, then the strength of current, through the addition of a small resistance, is changed so little that this change is hardly perceivable on the needle of the galvanometer. It is thus required that the difference in current which arises in the closing arc through very slight changes, shall be indicated by the galvanometer even without there being any considerable amount of resistance in the chain.

Wheatstone for this reason has suggested the following arrangement, which can also be very conveniently made use of to measure larger resistances as we shall describe hereafter.

On a board of some 14 inches long and 4 inches wide, (figs. 2 and 3,) we find in the form of a lozenge the four binding posts a, b, c and d, and between a

and d the binding posts e, f, as well as between d and b, the binding posts g and h. These binding posts are as is shown in fig. 2, connected with wires and binding posts a and b with the poles of the battery; between c and d a multiplier or a galvanometer m is inserted.

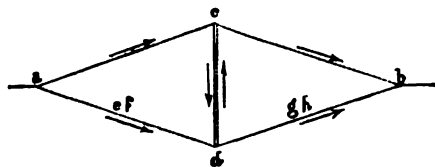


Figure 3.

If between e and f, g, h likewise, wires are inserted, then the current branches off in various ways; here however, only such parts of the current come into consideration as pass through the galvanometer m . One current passes in the direction a c m d g h b, as is indicated in fig. 3 by the drawn line; another part of the current goes in the direction a e f d m c b in opposite direction through the galvanometer, as is shown by the dotted line. Now, if the resistances in both conducting lines a c d b and a d c b are perfectly equal, then this is also so with both parts of the currents passing in opposite directions through the galvanometer m , and hence the needle must remain at zero.

Now, if the length of the wire between e and f, is changed but a little, the resistances a c d b and a d c b, and consequently also both portions of current will no longer be perfectly equal, hence the difference of the currents must operate upon the needle and will be the more perceptible as the total of all the resistances being small, a slight alteration of them will cause a decided movement.

In fig. 4, battery Z K is inserted, and the current forks off among others from A:

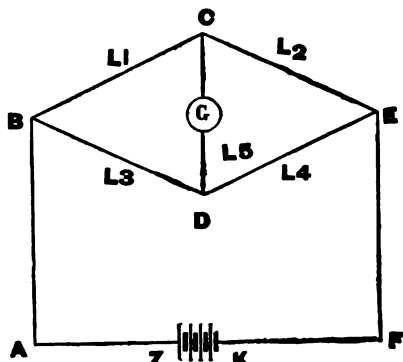


Figure 4.

(1) In the direction A, B, D, C, E, F, from D to C, through galvanometer G.

(2) In the direction A, B, C, D, E, F, from C to D, through galvanometer G.

If in consequence of these two currents moving in opposite directions through G, the needle G remains in a state of rest, then the resistances on both sides B, D, C, E and B, C, D, E, are necessarily equal to each other.

Now we find the reduced lengths of B, C = l_1 , of C, E = l_2 , of B, D = l_3 , of D, E = l_4 , of C, D, inclusive of the galvanometer, = l_5 .

If we consider B, C and B, D, C to be two branches starting from B, and uniting again in C, in which the current arriving at B becomes divided, so that after being united at C it flows towards C, E, then the reduced resistance of both these currents B, D, C = $l_3 + l_4$ and B, C = l_1 .

$$\frac{(l_3 + l_4) l_1}{l_3 + l_4 + l_1}$$

We find the same resistance, when we consider B, C, D = $l_1 + l_3$ as the first, and B, D = l_3 as the second branch.

$$\frac{(l_1 + l_3) l_3}{l_1 + l_3 + l_3}$$

Hence the resistance of both combined branches and of wire C, E = l_2 together

for current route $\left\{ \begin{matrix} B, D, C \\ B, C \end{matrix} \right\}$ C, E $\frac{(l_1 + l_3) l_1}{l_1 + l_3 + l_3} + l_2$

and $\left\{ \begin{matrix} B, C, D \\ B, D \end{matrix} \right\}$ D, E $\frac{(l_1 + l_3) l_3}{l_1 + l_3 + l_3} + l_2$;

These two last-named resistances, however, ought to be equal to each other in case the needle G remains in a state of rest; hence, after removing the denominator $l_1 l_3 + l_1 l_3 + l_1 l_3 + l_3 l_3 = l_1 l_3 + l_3 l_3 + l_1 l_3 + l_3 l_3$,

Likewise the resistances on routes B, D $\left\{ \begin{matrix} D, C, E \\ D, E \end{matrix} \right\}$

to E and B, C $\left\{ \begin{matrix} C, D, E \\ C, E \end{matrix} \right\}$ to E ought to be equal to each other; these resistances are relatively

$$l_3 + \frac{(l_1 + l_3) l_4}{l_3 + l_3 + l_4} \text{ and } l_1 + \frac{(l_1 + l_3) l_2}{l_1 + l_3 + l_2}$$

Hence, when we equalize the latter expressions, take away their denominators, and remove some terms: $l_3 l_2 - l_1 l_3 - l_1 l_3 - l_3 l_2 = l_1 l_4 - l_3 l_2 - l_1 l_3 - l_3 l_2$.

If we add up both equations we obtain $2 l_1 l_3 = 2 l_1 l_4$

or

$$l_3 l_2 = l_1 l_4$$

or also

$$\frac{l_2}{l_4} = \frac{l_1}{l_3}$$

After this it is evident that when the three resistances, l_1, l_3, l_4 , are known, resistance l_2 can be made out easily from the already known resistances; namely it is then

$$l_2 = \frac{l_1 \cdot l_4}{l_3}$$

Hence it follows, that in case the needle of the galvanometer remains standing at zero, the result for Wheatstone's bridge will be, that the products of the opposite sides of the figure, which the wires form on both sides of the needle, are equal to each other.

Kirchhoff's Laws.—Kirchhoff is entitled to the credit of discovering the general laws by which every problem relating to the ramifications of electric currents can be solved. These laws, the result of an exhaustive mathematical study, are as follows:

1. The sum of the current strengths in all those wires which converge to a point is equal to nothing. (The potentials of the currents which flow from this point have opposite signs from those flowing toward it.)

2. The sum of all the products of the currents and resistances in all the wires which form an inclosed figure is equal to the sum of all the electro-motive forces in the same circuit.

(All the potentials are to be indicated as positive ones, when the currents in the closed figure, according to their direction, keep up progressively the same direction; in the other case the intensities of the opposite currents are to be taken as negative.)

The correctness of the first point is obvious from figure 5.

Suppose the intensities of the currents in the wires $a_1, a_2, a_3, b_1, b_2, b_3$, are successively indicated by $S_1, S_2, S_3, S_4, S_5, S_6$, then we find, as the three first named currents flow towards point c, and others flow from it.

$$S_1 + S_2 + S_3 - S_4 - S_5 - S_6 = 0.$$

If this were not so, either the electricity must accumulate at point c, which would be contrary to

all experience and to every conception of electricity in motion, or more electricity must flow from point c than flows towards it, which is obviously impossible.

The proof of the second law, owing to its generality, cannot be given in an elementary manner, except by a very minute and lengthy exposition. In order to demonstrate this fully we must refer to figure 1.

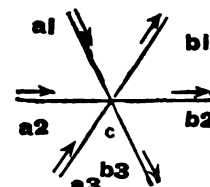


Figure 5.

If we represent the electromotive force of Battery Z, K, by E, the resistance in the undivided wire A, Z, B, K, by w, the resistance in the branch by l_1 and l_2 , the intensity in the undivided wire A, Z, K, B, by S, corresponding in the branch with S_1 and S_2 , we find, according to law No. 2, in the closed figure A1, B1, because there is no electrical power in it at all,

$$S_1 l_1 - S_2 l_2 = 0 \dots \dots \dots (1)$$

Where the second product of the way l_2 is to be taken negatively, as the direction of the current in this way is contrary to the current of the first way, which is flowing in the direction A1, B1, and which, in the other way, continually flows in the direction B1, A1.

According to the same law, we find in the closed figure Z, A1, B, K,

$$S, w + S_1 l_1 = E \dots \dots \dots (2)$$

and in figure Z, A1, B, K,

$$S, w + S_2 l_2 = E \dots \dots \dots (3)$$

A little calculation will plainly show the manner in which Kirchhoff's laws produce the same results, which we have already described:

$$S_1 \cdot l_1 = S_2 \cdot l_2, \text{ or } S_1 : S_2 = l_2 : l_1.$$

For point A, however, is according to the first law:

$$S - S_1 - S_2 = 0 \dots \dots \dots (4)$$

When we take from (2) and (3) the value of S_1 and S_2 , viz.:

$$S_1 = \frac{E - S w}{l_1} \text{ and } S_2 = \frac{E - S w}{l_2} \dots \dots \dots (5)$$

and substitutes the same in the equation (4), so is

$$S - \frac{E - S w}{l_1} - \frac{E - S w}{l_2} = 0$$

and hence

$$S = \frac{E(l_1 + l_2)}{w \cdot l_1 + w \cdot l_2 + l_1 l_2} \dots \dots \dots (7)$$

When we put this value for S in the equations (5) and (6) we obtain

$$S_1 = \frac{E l_2}{w l_1 + w l_2 + l_1 l_2} \text{ and } S_2 = \frac{E l_1}{w l_1 + w l_2 + l_1 l_2} \dots \dots \dots (8)$$

just as plainly as according to Kirchhoff's laws, the proposition regarding Wheatstone's bridge. If we indicate the resistance in the undivided wire E, F, K, Z, A, B, in fig. 4, by w, the entire strength of current in this wire by S, the resistance in the wires BC, CE, BD, DE, CD by l_1, l_2, l_3, l_4, l_5 , and the correspondent strengths of current in this wire by s_1, s_2, s_3, s_4, s_5 , then will the strength of current in CD, be indicated by g, according to the first law.

$$\text{For point B } s = s_1 + s_2 \dots \dots \dots (a)$$

$$\text{“ “ } E s = s_2 + s_4 \dots \dots \dots (b)$$

$$\text{“ “ } C g = s_1 - s_3 \dots \dots \dots (c)$$

$$\text{“ “ } D g = s_4 - s_5 \dots \dots \dots (d)$$

According to the second law

in figure B C D $g l_1 = s_1 l_1 - s_1 l_1 \dots (e)$

" " D C E $g l_1 = s_1 l_1 - s_1 l_1 \dots (f)$

It follows from the equations a—d

$$s_2 = s_4 - g; s_1 = s - s_2 = s - s_4 + g; s_2 = s - s_4$$

If, now, we put in these values (e) and (f) then

from (e) $g l_1 = l_2 (s_4 - g) - l_1 (s - s_4 + g)$

" (f) $g l_1 = l_2 (s - s_4) - l_1 s_4$

or,

$$g l_1 + g l_2 + s l_1 + g l_1 = s_4 (l_2 + l_1)$$

$$- g l_1 + s l_2 = s_4 (l_2 + l_1)$$

Now, if we divide both last named equations, and solve the newly originating equation according to g , then we obtain, after some reductions, this intensity of current in wire C D, or in galvanometer :

$$l_2 l_1 - l_1 l_1$$

$$g = s \frac{l_2 (l_1 + l_2 + l_1 + l_1) + (l_1 + l_2) (l_2 + l_1)}{l_2 (l_1 + l_2 + l_1 + l_1) + (l_1 + l_2) (l_2 + l_1)} \dots (g)$$

In case that, as in the practical use of the bridge, the current in the galvanometer is nought, we get from (g)

$$l_2 l_1 = l_1 l_1$$

or

$$l_2 = \frac{l_1 l_1}{l_1}$$

Bosscha's Laws.—Bosscha has given some additional points to Kirchhoff's laws, which very much simplify the calculation of branch currents. These are :

1. When in a system of wires, which receive any electromotive forces, there is a wire in which the intensity is equal to nought, nothing is changed in the intensities of the currents in the balance of the wires, when this wire is taken away with the electromotive force which is to be found in it.

2. If there is at the same time in this wire no electromotive force at all, then after its withdrawal we may connect the terminal points m and n directly with each other, without changing through this the remaining intensities of current. If, on the contrary, an electromotive force is obtained, then an equal and corresponding power in all at m or n , ending wires ought to be added thereto.

3. When in a system of linear wires, there are two wires a and b , in which an electromotive force at a produces no current at b , then, without changing the intensity at b , the wire a may be cut, and likewise, without altering the intensity at a , the wire b may be cut. Likewise the extreme ends of the wires which are cut, may be joined together directly.

PROJECTED CABLE BETWEEN ASPINWALL AND SANTA MARTHA.

The Colombian Government has made a contract, which, if ratified in London, will secure to that country a submarine cable between Aspinwall, Cartagena, Savanilla and Santa Martha. The distance from Aspinwall to Santa Martha is 350 miles. The rate of charge to be \$5 for the first ten words, 50 cents for all above that. The Government is to give an annual subsidy of \$25,000 for eight years. The Government has also agreed to give to the Company that undertakes it an annual subsidy of \$10,000 to maintain telegraphic communication between Panama and Peru, touching at Buenaventura. From Bogota to Panama, via Buenaventura the charge will be \$5 for each ten words, but to Payta \$6.

THERE is a great difference between an art and a science : an art teaches us to do, a science to know. The object of science is knowledge ; the objects of art are works. In art truth is means to an end : in science it is only the end.—W. H. Prescott.

QUADRUPLIX TELEGRAPHY.

[From the Buffalo Courier.]

It is a well known axiom among railroad engineers that two trains of cars cannot pass each other on the same track, without considerable trouble ; and so self-evident is this proposition that it is only semi-occasionally that a Superintendent sees fit to enunciate it as one of the rules entering into the government of the road. Now and again, it is true, the axiom is disregarded, and afflicted families and premature obituary notices are among the results. Until within the past year two trains of intelligence could not pass on the same telegraphic wire without a fearful dislocation of ideas and general demoralization. The railroad men have no immediate prospect of overcoming the trouble of which we speak, while the electricians have accomplished wonders in the development of telegraphic resources.

THE OLD SYSTEM OF TELEGRAPHY

allowed a single Morse wire, in a lively circuit, to average per hour about forty messages, of twenty words each. A message going one way or the other occupied the wire to the exclusion of every other message.

THE DUPLEX SYSTEM

was inaugurated by the Western Union Company two years ago last February. This doubled the capacity of a wire and allowed two messages to be sent over it simultaneously, increasing its capacity to an average of eighty messages an hour. This system was practically the invention of Mr. Joseph B. Stearns, a gentleman who stands high as an electrician, and was hailed by all interested in telegraphy as a marvellous improvement ; but the end was not yet. About a month ago

THE QUADRUPLIX SYSTEM

was put into operation between New York and Boston, and was found to work admirably. This quadruples the transmitting capacity of the single wire, and allows four messages to be sent over it simultaneously. The New York and Boston circuit being a short one, it remained to be determined whether the system would work as effectively on a long circuit. Yesterday afternoon the test was made between this city and New York, and worked to perfection. The Quadruplex system was worked by Managers Hucker and Tillinghast, and their assistants, Messrs. Henning and Kitton, in presence of Mr. Gerrit Smith, of New York, Assistant to the Electrician of the Western Union Company, Mr. C. H. Summers, Electrician of the Central Division and reporter of *The Courier*. It was raining in New York, and consequently the weather was not the best for a brilliant trial ; but the value of the Quadruplex system will be readily inferred when we state that *there were sent and received, simultaneously over a single wire, two hundred and thirty-three messages in one hour*. The messages sent and received were such as constitute the every-day business of the Western Union offices, and, supposing them to average twenty words each, we have an aggregate of *four thousand six hundred and sixty words over a single wire in sixty minutes*—a wonderful achievement in telegraphy. The Quadruplex System, as tested on a long circuit, worked to the satisfaction of all, and the probabilities are that none of the circuits in the country will be found too long for its use. To-day the system will be put in practical operation between here and Chicago ; and soon there will be established a New York and Chicago circuit. Another feature of the Quadruplex system may be mentioned here. Supposing it to be used on the New York and Chicago circuit, the Buffalo operators can use

the wire in either direction, providing it is not carrying its full load. One or two messages coming from any one way will allow the Buffalo operators to use it for the transmission of a single message, or two messages simultaneously, in an opposite direction.

THE INVENTORS

of the Quadruplex System of Telegraphy are Mr. George B. Prescott, Electrician of the Western Union Company, New York, and Mr. T. A. Edison, Electrician, also of New York.

THE VALUE OF THE INVENTION

can scarcely be approximated by the aid of any data at our command. It is said to be worth more to the Company than the wires it displaces or represents. The interest, taxes and maintenance of every mile of the Company's wire is estimated at \$8 per annum. The Quadruplex system makes one wire do the work of four, and the saving to the Company in this respect can be easily calculated when we state that at the close of the year, June 30th, the Company had in operation 71,585 miles of line and 175,185 miles of wire. Between New York and Chicago alone the use of the Quadruplex upon one wire will afford such extra facilities as could only be secured to the Company by the erection of additional wires whose simple repairs, to say nothing about the original cost, interest or taxes, would cost the Company \$25,000 annually.

The public will, by and by, experience a great benefit from the improvement in the shape of a reduced tariff, and, instead of sixteen millions of messages being sent over the wires in a single year, we shall hear of that number being quadrupled in a comparatively short time.

THE HIGHEST TELEGRAPH OFFICE.

The Western Union Telegraph Company on Sunday, Dec. 6th, opened offices at Fair Play and Alma, Colorado. The latter place is supposed to be the highest regular telegraph station in the world, being 10,500 feet above the level of the sea.

IMPROVEMENTS IN MILITARY TELEGRAPHY.

The *Journal Télégraphique* describes the system recently patented by M. Lemasson in France. Its chief feature is the capability of being rapidly set up, an all-important requirement for military telegraphy. The posts are each made in two or three sections, fitting into one another, thereby allowing them to be reduced to a half or a third their greatest height. The lowest section, in order to facilitate erection, is provided at its extremity with a steel point ; the upper section is furnished with ebonite insulators, which screw on to the ends of the posts. Steel fastening collars, or rings, fitted with screws to press and contract the collars, bind together the sections and permit the heights to be regulated according to the exigencies of the service. On a march the posts may be taken to pieces, and, therefore, more easily handled than is the case otherwise, especially when, as in steep and rugged roads, they have to be transported on the backs of mules. The construction of a line on ground open to fire can be carried out at the height of a man without need of ladders or exposure of men. Once so constructed, it is simply necessary to raise by hand the different sections, and fix them to the lower sections by means of the steel collars at the desired elevation. Similarly in the case of breakage the broken portions can be easily lowered and repaired. Experiments on different grounds prove that by this system lines can be erected at the rate of two kilometres the hour, or quick enough to follow the movements of a *corps d'armée*.

THE TELEGRAPHS OF QUEENSLAND.

(From the Telegraphic Journal.)

We have lately received a copy of the report submitted by Mr. Cracknell, the Superintendent of Telegraphs in Queensland, upon the condition of his department during the year ending 18th June, 1874, accompanied by a carefully executed skeleton map of the circuits now at work, as well as of the lines in course of construction, in that colony.

The first line erected in Queensland, that from Brisbane to Ipswich, twenty-five miles in length, was opened for the dispatch of public business on the 18th of April, 1861. Since that date rapid progress has been made, and when this report was issued there were in all 3,203 miles of line, carrying 3,981 miles of wire; seventy-four stations had been opened, and the entire system was managed with a staff of 181 members.

The lines are principally built ironback, with bloodwood, box, cypress, pine and gum; occasionally iron poles have been employed in neighborhoods where thunderstorms are rife, so as to guard against the ravages of atmospheric electricity. They are reported to have worked, "on the whole, well" throughout the year; the only serious difficulties that had to be encountered were the damages wrought by storms and bush fires.

The Morse instrument, in closed circuit, is universally employed, even at the stations upon the railway from Brisbane to Tornormba, which is under the supervision of the Department. It is said to work well, although it is a question whether the single needle, in its improved form, which experience upon the English railways has proved to be so well adapted for the purpose, would not do better. The difficulties in the matter of adjustment must necessarily be considerable unless some mode of double circuit working is made use of. Upon one circuit, Bowen to Kimberley, 619 miles in length, there are no fewer than twelve instruments.

Arrangements are being made for the purpose of forming a school in connection with the central office at Brisbane, at which the telegraphists may be trained previous to entering the service of the department. The qualifications required of them are, that "they must be between fifteen and twenty-four years of age, in a perfect state of health, capable of writing a clear, legible hand, of composing and spelling correctly, and well grounded in geography, grammar and arithmetic." In addition to the ordinary mechanical requirements of sending and receiving which every telegraphist must possess, the Department has very wisely determined to include in the course of instruction "sufficient technical training to enable the candidate to detect and remedy ordinary faults both in the offices and on the lines," and to subject every candidate to an examination in this before he receives an appointment. That every telegraphist should possess this knowledge is important; it becomes doubly important in a country like Queensland, where the offices are so widely apart, and the means of traveling so limited. We are not aware whether the Home Department now insists upon this, but, if not, they might certainly do worse than take this leaf from the book of the Queensland Department.

The offices are divided into three classes with regard to the distribution of staff—those at which there are both operators and line repairers, those at which the line repairer is in charge, and those at which the operator is in charge. The staff of the central office at Brisbane numbers twenty, and is made up of a station-master, eight operators, three clerks, one line repairer and seven messengers. On

the subject of staff Mr. Cracknell says: "I would take this opportunity of again drawing attention to the inefficient working of those offices where the duties of telegraph station-master and postmaster are combined. In my report dated 1st May, 1867, I pointed out that it would be injudicious to amalgamate the offices in question, and if persisted in would result in disappointment and failure. Subsequent experience has strengthened this belief, and I have no hesitation in recommending that they should again be placed under separate management and control."

We cannot well see to what this inefficient working can be due. No one could be expected to undertake either the postal or the telegraph duties of any office without a special training in each branch, and for some time after two services like this are amalgamated complaints and unsatisfactory working must occasionally be looked for. The telegraphists in England are now under the postmasters, but the latter, we should imagine, as a rule, know comparatively little of the details of telegraph work. They would rather leave it to the clerks in charge, who came over from the old telegraph companies. Yet, now that the two services are under the same management, we should be inclined to think that every effort will be made to assimilate them as far as possible, and throw open the prizes in the department, such as the appointment to postmasterships and the like, equally to the telegraphist and the postal clerk.

On the 1st of November, last year, the charges were reduced, and the uniform tariff was adopted of "one shilling for ten words, exclusive of address and signature, with one penny for each additional word; press messages not to exceed half rates." The inter-colonial rates were likewise lowered. To New South Wales the tariff is two shillings for ten words, and twopence for every additional word; to Victoria and South Australia, three shillings for ten words, and threepence for each additional word, with the exception of messages to stations on the Port Darwin line, for which much higher rates are demanded. The effect of this reduction was that the traffic for the first six months increased 65 per cent., although there was a falling off in the gross receipts of about 10 per cent., which, however, will doubtless soon be compensated for by the constantly increasing business. From Brisbane, and the other principal stations in the colony, the numbers are more than double what they were under the old tariff; at the smaller stations they remain about the same.

The expenditures for the year was £630 15s. 2d. in excess of the revenue, which includes the value of the Government messages passing over the wires. But in addition to these there is a large number of messages which are not charged, and which are not included in the revenue. Not only is shipping intelligence from stations within the colony, as well as from Sydney, Melbourne and Adelaide, regularly transmitted and posted for the public information, but meteorological observations also are taken daily at several of the stations, transmitted to Brisbane, and posted at the central office; the rainfall is likewise registered by all the station-masters at nine every morning, and sent along with wind and weather reports to Brisbane and all the principal stations free of charge.

We are rather surprised to learn that for the twelve months ending 31st of December last, only 340 international messages were dealt with at all the stations in Queensland. This is accounted for by the almost prohibitory tariff which is in force for these, a message of twenty words from Brisbane

to London costing no less than £9 16s. 6d. It is not, therefore, to be wondered at that efforts are being made to break down the existing monopoly, and negotiations are now in progress for the purpose of establishing a second and independent line from Australia to Europe. The route suggested is via Kimberley, at the south of the Gulf of Carpentaria to Singapore—Sumatra and Java being thus avoided altogether. English telegraphists would be employed throughout. The proposal has already received the sanction of the Parliament of New South Wales, New Zealand and Queensland; and a guarantee of 5 per cent. per annum on the cost of constructing the lines has been promised by them. There is nothing, therefore, now to stand in the way, and this important work, the immediate effect of which will be to reduce the cost of a telegram between the United Kingdom and our Australian Colonies by at least £3 7s. 5d., will, Mr. Cracknell assures us at the close of his report, be commenced without delay.

NEW ZEALAND TELEGRAPHY.

(From the Telegraphic Journal.)

Reports are periodically received in this country from New Zealand of the condition of telegraphy in that portion of the Empire. An independence of action and an original mode of procedure in the administrative and commercial direction of the business are evidenced, which are watched with lively interest. Uniform success and constant progress seem the text of each report. That for the year 1873-'74 is no exception.

The revenue was estimated at £45,000, but it has exceeded that amount by nearly £2,000.

On the 1st November, 1873, the tariff for private messages was reduced to 1s. for ten words, and 1d. for every additional word—address and signature, up to ten words, being transmitted free of charge. At the same time, the Press rates between 8 A.M. and 5 P.M. were made one-half the private rate, the charge after 5 P.M. being reduced to 6d. for the first twenty-five words, and 3d. for every additional twenty-five. As the alterations in the Press rates involved an advance on the former day rates, provision was made in the new tariff to enable evening papers to receive during the day two hundred words of interprovincial news at evening rates; and also to receive, on the arrival of an English or Australian mail, an additional two hundred words of either or both at the same rates.

As a consequence of this great reduction the number of Press telegrams sent during the year exceeded that of the previous year by some 17,000, or an increase of over 50 per cent.; while the cash receipts for them were nearly £600 less than the corresponding receipts of the previous year. In other words, during 1872-'73, 32,323 Press telegrams were forwarded, at a cost of £4,601 11s. 6d.; while in 1873-'74, 49,125 Press telegrams were forwarded, at a cost of £4,066 1s. 1d.

During the year 752,899 telegrams of all codes were transmitted, being an increase of 183,939, or more than 24 per cent. over 1872-'73.

The number of Money Order telegrams sent during the year was 8,001, representing a value of £38,052 14s. 9d., or an increase of 2,210 messages, and of £9,945 18s. 1d., as compared with the previous year. The commission collected by the Post-Office was £1,085; and after deducting £400 1s., due to the Telegraph Department as fees on the telegrams, there remained to the credit of the Post-Office, as commission on exchange, £684 19s., or more than 1½ per cent. on the amount transmitted. Dunedin,

Wellington and Christchurch, and their respective sub-offices, issued the largest number of orders; and the same offices paid the largest number, except that Auckland and its sub-offices stand second in that respect.

The length of line maintained was 2,530 miles, at a cost of £6 3s. 11d. per mile. During the year twelve new offices were opened.

The total earnings of the Department for the year were £59,875 0s. 11d., which, deducting the cost of the Signals Department and maintenance of lines, leaves £6,026 6s. as interest upon the capital expended, £249,594 12s. 9d. This result is highly satisfactory, when it is remembered that it has been secured after reductions in the tariff, as before stated.

The number of telegrams transmitted during the year (752,899) compared with the number of inter-provincial letters posted during the year, shows that 23.45 telegrams were sent for every 100 letters posted. In some provinces 28 telegrams have been sent for every 100 letters posted. The population on the 30th June amounted in round numbers to 300,000, so that the total number of telegrams during the year is somewhat in excess of an average of 2½ per head.

At the close of the year 2,530 miles of line, carrying 5,182 miles of wire, were in circuit. It is contemplated to make, during the present year, large additions to this mileage, which is rendered necessary by the still increasing business of the Department.

The following extracts read quaintly to home ears: "In February, one of the turrets for carrying the wires across the Thames was accidentally burned down. A turret to supply its place is now nearly completed." "The clearing of a track to facilitate the examination of the line between Waitakaruru and Piako has been let by contract, and is rapidly approaching completion."

Duplex telegraphy has, through the skill and perseverance of Mr. C. Lemon, been successfully adopted, though no details of the system used have been given in the report. It is said to have saved the costly necessity of laying a second cable across Cook's Strait, and to differ, in some important details, from all arrangements for a similar purpose yet worked out in Europe or America. We shall be glad to learn more of this antipodean novelty. Mr. Lemon has received the thanks of the Government of the Colony.

THE Anglo-American Telegraph Company have established themselves in new offices in Throgmorton street, London. The main feature of the new arrangement is, that the Central Office is now connected by special wires with Valentia, and telegrams handed in at Throgmorton street will be instantly carried to the Valentia Station, to be at once despatched thence through the cables to America. Messages for New York, the West Indies, and other places on the other side of the Atlantic, will therefore now be free from any delay which might naturally arise from their having to take their turn with the ordinary business of the English inland postal telegraphic service. Of course these benefits will also accrue to the City traffic from, as well as to, America. A further important advantage is obtained from the fact that American dispatches received in the city are at once delivered at their destination by the special messengers employed by the Anglo-American Telegraph Company.

THE VISIT OF KING KALAKAUA.

CONGRATULATIONS BY TELEGRAPH.

The King of the Hawaiian Islands, now visiting the United States, inspected the various departments of the Western Union Telegraph Office, in San Francisco, on Dec. 4th. The wires were connected through to Washington, and King Kalakaua exchanged compliments with President Grant, and afterwards with the Mayor of Chicago. The following is the correspondence, all of which was conducted in less than 40 minutes:

SAN FRANCISCO, Dec. 4, 1874.

To the President of the United States:

Kalakaua, King of the Sandwich Islands, sends greeting to his great and good friend the President of the United States of America. He acknowledges a generous reception, characteristic of a warm-hearted people, and will hasten to express in person those sentiments of sincere respect and lasting friendship entertained toward the President of the great nation he so worthily represents.

WASHINGTON, D.C., Dec. 4, 1874.

The President of the United States extends the cordial welcome of the nation to his great and good friend, His Royal Highness Kalakaua, on his arrival in the United States, and tenders his personal congratulations on the safety of his voyage. The President anticipates with great pleasure the opportunity of a personal greeting, and assures His Highness of the sincere friendship which in common with the people of the United States he entertains for His Royal Highness, and hopes that his journey across the continent may be guarded by a kind Providence.

The following was sent from Chicago on the same occasion:

CHICAGO, Dec. 4, 1874.

To His Highness, King of Hawaii, San Francisco:

The Mayor of the City of Chicago congratulates His Majesty, the King of Hawaii, on his safe arrival upon the soil of the United States of America. He trusts soon to have the honor and pleasure of welcoming him to the City of Chicago. He also trusts that His Majesty's visit to the United States will prove not only pleasant to himself and suite, but highly useful to both countries. In these sentiments I am heartily joined by the other official authorities, and by the citizens of Chicago generally.

THE TELEGRAPH COMPANIES.

Lately a cry has been raised against the monopoly enjoyed by large telegraph companies, but the remedy suggested is worse than the disease, namely, that the government should take possession and manage the telegraphs, as it does the post-offices. This would only be adding another vehicle for official corruption and a sure stepping-stone to obtain inefficient operators. Political partisanship would be the recommendation for appointments, and advancement for capacity would be out of the question, as is now the case among so many government employes, who are so often set aside, no matter how able and supplanted by inferior men, at every change of administration.

We would much prefer the reverse, and accept Mr. James Parton's proposal, which he lately brought before the Liberal Club in New York, namely, to turn the post-office department over to the now so effective and reliable express companies, make the postmasters express agents, and compel the express companies by law to act according to prearranged regulations. The surest way to reform governmental corruption is to curtail the means which may be employed for this end, and among these the power of giving offices to political partisans is one of the most important, while if we give the government the management of the telegraph companies, and of the railroads, as has also been suggested, to the most corrupt and dishonest class of men in the

nation would be given the opportunity to steal millions where now they steal thousands.

We say let well enough alone; and we think that if most railroad companies take an unfair advantage of the traveling public in every case where they see a chance to do it, this can not be said of the telegraph companies. Thus, for instance, the Western Union Telegraph Company, a really gigantic corporation, has, since 1868, diminished the average rates to less than one-half, while the number of messages has more than tripled. We must also not forget that the distances, and consequently the expense of the lines are much greater here than in England, where the total number of lines from London to the eleven principal towns is less than 2,200 miles, while the total sum of the distances from New York to the eleven principal cities of the United States is 11,000 miles, giving the average distance for each, 200 miles in England and 1,000 miles in the United States. The extreme distance between two stations in Great Britain is 800 miles, while the greatest distance between many extreme offices belonging to the Western Union is 6,000 miles.

This company besides deserves praise for continually establishing additional offices and lines. They have for a long time put up 20,000 miles of wire per year, and devoted to this the greater portion of its revenue; while now the introduction of the duplex and quadruplex system, so successfully commenced between New York and Boston, and soon to be established on other lines, will result in giving to the public greater facilities by increasing the capacities of all the existing wires.—*The Manufacturer and Builder.*

THE LEASE OF THE FRANKLIN LINES.

A press telegram dated Boston, Dec. 11th, states that a petition has been filed in the Supreme Judicial Court of Suffolk County, by a majority in number, as alleged, of the stockholders of the Franklin Telegraph Company, praying that the late lease with the Atlantic and Pacific line for 99 years be vacated, as they deem it fraudulent and the rent of the line grossly inadequate; and that the Franklin Telegraph Company may be dissolved and a receiver appointed to sell the property and assets and divide them among the stockholders, after the payment of debts. The petition is signed by 75 stockholders, and will be heard on the first Monday of February.

THE TELEGRAPHS OF THE PRINCIPAL COUNTRIES OF THE WORLD.

COUNTRIES.	Length of		No. Offices.
	Lines. Miles.	Wires. Miles.	
Argentine Republic.....	4,148	8,059	80
Australia.....	11,978	18,466	836
Austria.....	11,965	31,510	1,687
Bavaria.....	4,256	13,875	755
Belgium.....	2,926	12,561	547
Brazil.....	2,067	2,211	64
British India.....	15,568	31,040	770
British Indo-European.....	3,378	3,414	10
Canada.....	11,899	18,969	1,143
Chile.....	2,090	3,143	53
Dutch East Indies.....	9,843	3,458	51
Denmark.....	1,577	4,364	177
France.....	30,779	79,983	2,344
German Empire.....	18,949	64,753	3,325
Great Britain.....	23,873	99,918	5,474
Holland.....	2,082	7,278	315
Hungary.....	8,819	28,290	887
Italy.....	12,087	41,543	1,318
Mexico.....	2,955	3,388	50
Norway.....	4,012	6,947	148
Portugal.....	1,529	3,550	120
Roumania.....	2,239	3,639	70
Russia.....	34,914	68,848	1,388
Spain.....	7,287	16,573	215
Sweden.....	4,371	11,196	330
Switzerland.....	3,623	6,784	800
Turkey.....	16,392	33,273	308
United States.....	85,585	185,135	7,350
Wurtemberg.....	1,378	3,000	294
	325,878	821,417	30,148

SEMI-MONTHLY CIRCULAR.

To all offices on W. U. Lines:

The following changes and additions have been made since the date of the last circular:

GENERAL INFORMATION.

Bolling, Ala., re-opened ; square 296.
Plantersville, Ala., closed.
Planters House, Colorado Springs, Col., re-opened ; check direct.
Noank, Conn., closed.
Hereafter the "tariff for other lines" to Silver City, Idaho will be \$1.25 for ten words or less, and 8 cents for each additional word from Winnemucca, Nev.
Georgetown, Ga., re-opened.
Danby, Ill., changed to Prospect Park.
Montrose, Ill., square 307, is in Cook Co. ; P. O. Irving Park.
Messages for Plank Road, Ill. (office now closed), and for Jefferson, Ill., are delivered from Montrose, Cook Co. Charges for delivery 50 cents.
Cannelton, Ind., closed.
Grandview, Ind., closed.
La Croix, Ind., changed to Otis.
Newburg, Ind., closed.
Rockport, Ind., closed.
Tell City, Ind., closed.
Hawesville, Ky., closed.
Owensboro, Ky., closed.
Uniontown, Ky., closed.
Hereafter business for Brimfield, Indian Orchard and West Warren, Mass., will be checked direct.
The office on other lines at Baldwin's, Mich., is in Jackson Co.
Clyde, Mich., square 290, is in Oakland Co.
Messages for the following other line offices in Michigan, will hereafter be checked to and sent via Detroit *only*.
Dundee, Morenci,
Groesse Isle, Summit Sta.
Salamanca, N. B., closed.
Business for Spottswood, N. J., will hereafter be checked to Jamesburg.
Fort Ticonderoga, N. Y., closed.
Oriskany, N. Y., closed.
Verona, N. Y., closed.
Messages for St. John's School, near Manlius, N. Y., are delivered from Manlius Village ; charges for delivery 30 cents.
Belle Valley, O., re-opened, square 181.
Green Springs, O., closed.
Messages for Fayette, Fulton Co., O., will hereafter be checked to and sent via Detroit, Mich., only.
Stryker, O., is now open at night only.
Martinsburg, Butler Co., Pa., closed.
Street Road, Pa., re-opened, square 59.

NEW OFFICES:

599 Alma, Col.
599 Fair Play, Col.
346 Cleveland, Ill.
307 Prospect Park, Ill. (formerly Danby).
288 Otis, Ind. (formerly La Croix.)
896 Benton, Iowa.
896 Dysart, Iowa.
896 Traer, Iowa.
100 Acme, Mich.
187 Baldwin, Lake Co., Mich.; P. O. Baldwin City.
127 Cherlevoix, Mich.
260 Clyde Centre, Allegan Co., Mich.
138 Culver, Mich.
138 Roscommon, Mich.
270 Stevensville, Mich.
100 Torch Lake, Mich.
260 Zeeland, Mich.
4 Florenceville, N. B.
4 Gibson, N. B.
4 Hartland, N. B.
* Centre Village, N. Y. { 40 3 45 Albany.
 { 30 3 65 Binghamton.
41 New Brighton, S. I., N. Y., check Quarantine.
* Onaquaga, N. Y. { 40 3 45 Albany.
 { 30 3 65 Binghamton.
* Windsor, N. Y. { 40 3 45 Albany.
 { 30 3 65 Binghamton.
144 Monroe, N. C.
5 Horton Landing, N. S.
5 Kingston, N. S.

* Guysville, O.	{	60	4	323	Cincinnati.
		50	3	213	Chillicothe.
		40	3	181	Marietta.
* Shakespeare, Ont.					
* Lebanon, Tenn.		50	4	299	Nashville.
* Mt. Juliet, Tenn.		35	3	298	"
199 Borden, Texas.					
193 Schnlenburg, Texas.					
193 Weimar, Texas.					

TARIFF TO SQUARES 598 AND 599.

From square 557 to 598, 40 cents ; to 599, 50 cents.
From squares 558 and 565 to 598 and 599, 50 cents.
Offices having a rate to 557 of 40 cents, will add 85 cents for rate to 598 and 599.
Those having a rate of \$1.25 to 557, will add 25 cents for rate to 598 and 599.
Those having \$1.50 or \$2.00 to 557, will add 50 cents for rate to 598 and 599.
All other offices will add to their rate to square 557, 25 cents for 598 and 50 cents for 599.
No rate to squares 598 and 599 shall exceed \$2.50.

CUBA CABLE BUSINESS.

The Punta Rassa and Key West cable has been repaired. The \$3.00 per message, charged for steamer transportation during the interruption of the cable, will not be collected hereafter.

ATLANTIC CABLE BUSINESS.

We are notified that the cable between Singapore and Batavia is broken. Messages for Java and Australia are forwarded by post between Singapore and Batavia.

WILLIAM ORTON,
President.

EXECUTIVE OFFICE,
WESTERN UNION TELEGRAPH COMPANY,
NEW YORK, Dec. 10th, 1874.

On Friday, December 25th, 1874, and on Friday, January 1st, 1875, office hours will be from 8 to 10 o'clock A. M., and from 4 to 6 o'clock, P. M., except at repeating stations and principal offices, which will be kept open as usual, but with such reduction of force on duty as circumstances may permit.

GEO. H. MUMFORD,
Vice Pres't.

**SOUTHERN AND ATLANTIC TELEGRAPH
COMPANY.**

ANNUAL MEETING.

The annual meeting of the Southern and Atlantic Telegraph Company was held at the office of the company in this city Monday, Dec. 7th, 1874, and the following directors were elected for the ensuing year: Messrs. Francis Morris, Henry Hentz, Chas. W. Blossoni, Matthew Maury, Mayer Lehman, Chas. M. Fry, Amerton Yale, T. T. Bryce, Philip Tabb, Seth B. French, Frederick Zeraga, Jno. G. Maximos, B. G. Arnold, L. Hopkins, Eckstein Norton, Jno. T. Hanemann, Henry Morgan, W. H. Guion, A. B. Graves, L. M. Calvocoressi, R. W. Russell, New York; Robt. N. Gourdin, Savannah, Ga.; J. B. Lafitte, J. T. Doswell, New Orleans, La.; Jno. B. Palmer, Columbia, S. C.; James Crawford, Mobile, Ala.; Jno. W. Darr, Montgomery, Ala.; C. H. Strong, Atlanta, Ga.; Geo. H. Hazlehurst, Macon, Ga.; W. F. Middleton, Charleston, S. C.

The trustees of the Atlantic and Pacific Telegraph Company have resolved that the Executive Committee be empowered to offer to the stockholders of record of the Company, pro rata, 14,105 shares of reserved capital stock, to be taken and paid for by them in cash, at the rate of \$20 per share. It was further resolved that the proceeds arising from the sale of 14,105 shares of stock, or any part thereof, shall form a fund for the purpose of securing the construction or acquirement of additional telegraphic lines, or property as the same may be needed: and that the fund shall be made a special deposit, under the direction of the Executive Committee in some trust company or bank, and no draft shall be made against it except by order of the Executive Committee.

THE TELEGRAPHERS' MUTUAL BENEFIT ASSOCIATION.

ACKNOWLEDGMENT OF RECEIPTS FOR ASSESSMENTS
UP TO AND INCLUDING Dec. 10, 1874.

ASSESSMENT No. 71.

4, 5, 16, 21, 26, 28, 46, 53, 56, 74, 77, 86, 91, 98, 113, 121, 131,
145, 157, 181, 188, 208, 211, 217, 235, 245, 267, 274, 277, 286, 289, 301,
302, 349, 383, 385, 416, 434, 464, 487, 510, 526, 532, 536, 549, 549, 553,
564, 576, 584, 615, 622, 626, 649, 708, 715, 721, 731, 815, 821, 825, 832,
858, 890, 915, 916, 923, 941, 1001, 1013, 1024, 1039, 1054, 1061, 1064,
1126, 1154, 1173, 1175, 1178, 1182, 1183, 1198, 1199, 1225, 1252, 1259, 1282,
1296, 1300, 1304, 1306, 1345, 1357, 1368, 1371, 1394, 1402, 1403, 1404,
1409, 1410, 1440, 1518, 1527, 1550, 1568, 1571, 1590, 1695, 1708, 1735,
1815, 1831, 1852, 1862, 1894, 1901, 1944, 1950, 1951, 1985, 2019, 2027,
2030, 2036, 2049, 2082, 2135, 2143, 2164, 2174, 2175, 2178, 2214, 2228,
2229, 2238, 2239, 2241, 2250, 2287, 2289, 2306, 2306, 2311, 2312, 2322,
2330, 2333, 2334, 2336, 2337, 2338, 2340, 2341, 2342, 2343, 2344, 2345,
2346, 2347, 2348, 2349, 2350, 2351, 2352, 2353, 2354, 2355, 2356, 2357,
2358, 2359.

ASSESSMENT No. 70.

8, 812, 742, 859, 982, 1169, 1489, 1516, 1553, 1881, 1906, 2221,
2226, 2257, 2269, 2280, 2284, 2285, 2286, 2288, 2291, 2292, 2293,
2301, 2313, 2314, 2315, 2316, 2317, 2318, 2319, 2320, 2321, 2323,
2324, 2325, 2326, 2327, 2328, 2329, 2331, 2332, 2335, 2339.

ASSESSMENT No. 69.

27, 33, 51, 58, 76, 100, 148, 169, 182, 237, 238, 242, 246, 358,
429, 436, 451, 453, 455, 457, 476, 481, 527, 566, 604, 652, 725, 804,
869, 883, 899, 908, 920, 934, 1011, 1064, 1108, 1131, 1153, 1207,
1224, 1273, 1437, 1450, 1559, 1579, 1600, 1805, 1607, 1608, 1609,
1610, 1611, 1612, 1639, 1658, 1655, 1657, 1677, 1690, 1691, 1715,
1716, 1731, 1743, 1796, 1796, 1799, 1835, 1922, 1926, 1931, 1934,
1941, 1964, 1968, 1974, 1975, 1976, 1978, 1995, 2015, 2037, 2045,
2061, 2109, 2128, 2138, 2141, 2148, 2150, 2170, 2177, 2244, 2246,
2249, 2261, 2268, 2273, 2281, 2282, 2283.

ASSESSMENT No. 68.

185, 186, 187, 496, 497, 499, 500, 505, 507, 508, 693, 697, 705,
1071, 1104, 1400, 1504, 1556, 1557, 1570, 1613, 1670, 1741, 1921,
1945, 1946, 1987, 2151, 2236.

MISCELLANEOUS.

No. 67.—2115.
No. 66.—490, 506, 800, 1496.
No. 65.—496, 503, 2182, 2251.

Members of the Association who look to the JOURNAL OF THE TELEGRAPH for receipt of assessments paid, will please take notice, that an acknowledgment of the receipt of one assessment should be taken as a receipt for all previous assessments.

ANOTHER POSTAL TELEGRAPH SCHEME.

In the Senate, Tuesday, Dec. 8th, Mr. West of Louisiana introduced a bill which directs the Postmaster General without delay to construct a line of telegraph from Washington to Boston, *via* Baltimore, Philadelphia, New York and Hartford, to be operated in the Post-Office of these cities by appointees of the Postmaster General, under such regulations and at such rates of tariff as he may prescribe, provided that the rates shall be uniform to all persons, with such uniform reduction to the newspaper press as may be deemed advisable, and provided the rates shall be adjusted to meet and not exceed the expenses of operating and maintaining the said line, and providing a net income equal to five per cent. interest on the original cost of the same. The bill proposes to appropriate \$600,000 for the foregoing purposes.

THE DOMINION TELEGRAPH COMPANY.

The Dominion Telegraph Company of Canada has, during the past season, completed a second line from Toronto to Montreal by another route from that of the first line, which, while increasing their facilities for business, decreases the chances of interruption from storms or other causes.

This company has now about 16,000 miles of line and 300 offices.

ARGUMENT OF MR. G. P. LOWREY UPON THE POSTAL TELEGRAPH BILL.

(Continued from page 354.)

Mr. MARSHALL. You admit that the post-office has been established for the purpose of transmitting intelligence, and that the Constitution has, for the purpose of the transmission of intelligence, conferred the power upon Congress to establish post-offices; would it follow that that power would extend to any other means of transmitting intelligence?

Mr. LOWREY. No, sir; I think not. That is the essential ground of my argument against Mr. Hubbard's scheme.

Mr. MARSHALL. That comes to the point.

Mr. LOWREY. Precisely; and I shall address myself to that in a moment. I am glad that the discussion has taken this form. The very small skeleton of preparation which I have been able to make has been shattered long since, and I shall now bring in things as I happen to think of them. If I interrupt myself now in a comparison which I was making between the post-office and the telegraph, it is that I may answer the suggestion of Mr. Loughridge in relation to what the Government may do. You know that in England the Government has at present possession of the telegraph. It is under the control of Mr. Scudamore, a gentleman of very high intelligence and great industry. He succeeded, as I think, chiefly by weight of well-deserved official and personal influence, in inducing the Government to take charge of the telegraph lines and to assume the business. This was done in 1870. England is certainly a country in which the obligations of law are regarded as much as they are here, I am sorry to say very much more so, according to my experience. Yet in 1871, in England, it was possible that this case should arise which I am about to read to you, and that Mr. Scudamore should be brought to book by public opinion to answer for his arrogant use of a power necessarily in his hands as controller of the telegraph lines.

I read, from a special report of a Parliamentary Committee, a letter of Mr. Scudamore to his official superior:

GENERAL POST-OFFICE, December 30, 1871.

SIR: On the 7th instant I purposely delayed for several hours the delivery of a telegram addressed to the editor of the *Times*, the editor of the *Daily Central News*, the manager of the *Press Association*, and the manager of the *Central News*. On the 8th instant I forwarded a telegram to the editor of the *Standard*, and another telegram to the editor of the *Newcastle Chronicle*, the editor of the *Liverpool Albion*, the editors of the *Manchester Guardian*, the *Manchester Courier*, and the *Manchester Examiner*.

Later on he says:

I did not doubt for one moment that the press correspondents who had forwarded these messages had done so *bona fide*, and in the full belief that they were transmitting accurate information, but it was equally clear to me that they had received that information from the authors of the strike, and I could but think that it had been given in order that it might operate as a notice to those who were disposed to strike in other towns.

Later on he says:

I gather from the terms of the resolution passed by the Manchester Chamber of Commerce, that they supposed me to have altered and added to the messages of the 8th instant. This is a misapprehension. I forwarded the messages intact, together with a letter in my own name. I made no attempt to suppress or vary any part of them.

Mr. HUBBARD. Has not the Western Union Telegraph Company under similar circumstances done the same thing?

Mr. LOWREY. Not that I am aware of.

Mr. HUBBARD. Are you aware that it has not done so?

Mr. LOWREY. It is very difficult to be aware of all the things that have not been done.

Mr. HUBBARD. Will you furnish the committee with an answer to that question?

Mr. LOWREY. No, sir; I have no information on the subject.

Mr. HUBBARD. I simply ask that you will obtain from the officers of the Western Union Telegraph Company and furnish to the committee that information?

Mr. LOWREY. If you wish me to ask the officers of the Company to furnish the information, I will do it cheerfully. But if you ask me to give information about an imaginary fact, it is impossible for me to do so.

Mr. HUBBARD. It is not an imaginary fact.

Mr. PORTER. If Mr. Hubbard will specify any fact, we will furnish information in regard to it.

Mr. HUBBARD. I refer to the case of the telegraph strike two or three years ago. I have always understood, and been informed, and believe that dispatches were sent by the strikers to the various offices of the Company, but that the Company refused to forward and deliver them.

Mr. LOWREY. During the strike to which you refer, four years ago, the Western Union Telegraph Company's striking operators had entire possession of many of the lines, and I presume they sent what messages they pleased. I have read this letter of Mr. Scudamore's, not because Mr. Scudamore is on trial here, but because Mr. Loughridge asked me what might happen if the Government were to take possession of the telegraph, and I wanted to show what did happen in England.

Now, I presume that Mr. Scudamore acted with good judgment, and certainly with good faith, in the matter. I understand that there was an organized strike of his own men over the lines, and that they sought to convey information to the *London Times* and other newspapers of the strike, and I suppose it was a proper exercise of judgment that he should stop those messages. I only read the letter to show what could be done by the Government. Suppose that the Western Union Telegraph Company, although not a creature of the Government, and not amenable to this Congress, except as we are all amenable, had ever refused delivering to a newspaper a dispatch addressed to it; and that the officers of the Company had exercised their judgment as to whether the information was correct or not, as Mr. Scudamore did, what should we have heard on that subject?

Mr. HUBBARD. That is just what I have said the Western Union Telegraph Company has done.*

Mr. LOWREY. Since you assert that it has been done it will doubtless be convenient for you to prove it; certainly more convenient than for me to disprove what I have never heard before, and concerning which I do not think any officer of the Company could make any different answer.

The Committee here adjourned till 9 o'clock, May 29.

* I have made inquiry as requested by Mr. Hubbard, and find him mistaken. In 1873 a general strike of operators on the Western Union lines took place, during which most of the lines and offices were in possession of the striking operators. In San Francisco, however, that was not the case, and certain of the strikers who were "head centers" or other officials of the society by whose order the strike was made, deposited messages to be sent by us over our lines to such of our operators as were members of the order directing them to *cease work*. The superintendent at San Francisco refused to receive the messages at all. A lawyer, who was consulted by the would-be senders as to their rights (under the State statute imposing penalties for failure to send messages), advised them (by way of illustration) that in his opinion, although the Central Pacific Railroad is bound to send all freight offered, yet if a band of marauders

FOREIGN ITEMS.

THE traffic receipts of the Great Northern Telegraph, for the month of October, were 438,817 francs, against 360,437 francs for October, 1873. Total traffic receipts from January 1st to October 31st, 3,770,400 francs, against 2,748,568 for 1873.

THE number of messages (of twenty words each) passed over the Barcelona Marseilles Cable, for the month of October last, was 6,731 against 5,940 messages in the month of September.

IN Bolivia, South America, the telegraph to the North is now working through to Pacasmay and Payta.

THE traffic receipts for the month of October of the Eastern Extension, Australasia and China Telegraph Company, amounted to £16,584—a decrease of \$1,002 on the corresponding month of 1873.

THE traffic receipts of the Eastern Telegraph Company for the month of October last, amounted to £32,853—an increase of £3,624 on the corresponding month of 1873.

THE total number of messages forwarded from postal telegraph stations in the United Kingdom during the week ended Oct. 31, 1874, and during the corresponding week of 1873 has been:—Week ended Oct. 31, 1874, 380,428; week ended Nov. 1, 1873, 335,859; increase, 44,569.

THE total number of messages forwarded from postal telegraph stations in the United Kingdom during the week ended the 7th of November, 1874, and during the corresponding week of 1873, were:—Week ended 7th of November, 1874, 364,306; week ended 8th of November, 1873, 358,061; increase in 1874, 6,245.

On Tuesday, Nov. 16th, the steamer *Norseman*, belonging to the Western and Brazilian Telegraph Company, left the Thames with the shore end portion of the cable to be laid, in the interest of the Central American Telegraph Company, between Demerara and Cayenne, the remainder of the section following shortly in the steamship *Hooper*.

INFORMATION WANTED.

The address is wanted by Mr. Wm. Martin, Western Union Office, Boston, Mass., of Edward J. Smith, operator, supposed to be at some point in the Southern States.

BORN.

COMSTOCK.—At Frewsburg, N. Y., Oct. 30, 1874, to P. W. Comstock, Agent and Operator D. A. V. and P. R. R., a son.

GREENE.—At Carthage, Mo., Nov. 23, 1874, to A. H. Greene, Manager W. U. Tel. Office, a son.

HAMMATT.—At Wyoming, Ill., Dec. 4, 1874, to J. B. Hammatt, Agent and Operator P. & R. I. R. R., a daughter.

TINDLE.—At Mahanoy City, Pa., Nov. 25, 1874, to Thomas Tindle, Jr., Manager W. U. Tel. Office, a son.

MARRIED.

MERRICK—ARNOLD.—At the residence of the bride's parents, Keadallville, Ind., Nov. 4, 1874, by Mr. J. E. Erwin, F. B. Merrick, Operator and Ticket Agent L. S. & M. S. R. R., to Miss Libbie E. Arnold.

had taken possession of its road in the mountains with the purpose of blowing it up, the railroad company would not be compelled to transport nitro-glycerine from San Francisco as freight to be used for that purpose. The interference of Mr. Scudamore was in every respect different. He received, but suppressed regular press dispatches because he thought the news incorrect.

Journal of the Telegraph.

This Journal is issued on the 1st and 15th of each month. Its circulation is over 8,000. It goes to every State, Territory and Province on the Continent. It has become a necessity, and is always welcomed as a friend. No better medium for advertising exists.

TERMS:

TWO DOLLARS PER ANNUM IN ADVANCE.

Address—

JOURNAL OF THE TELEGRAPH,
Western Union Telegraph Company,
145 Broadway, New York.

NEW YORK, DECEMBER 15, 1874.

CLOSE OF VOLUME VII.

With this issue, Volume VII. of the JOURNAL OF THE TELEGRAPH is brought to a close. We believe that it will compare favorably with any preceding volume. No expense has been spared in its preparation, and its position as the standard American authority on telegraphic subjects has been fully maintained. Nothing will be left undone in the future to preserve its high and valuable character.

Such being the case, it will be well for those whose subscriptions expire with the close of the volume, and who desire to keep posted in current telegraphic information, to renew at once. Employés of the Western Union Company are entitled to receive the paper for one dollar per year, which is one-half of the regular subscription price.

AND now, with itching palm, comes another party with longing gaze upon the public purse. At this time all that is wanted is the trifle of \$600,000, wherewith to build a line of telegraph from Washington to Boston. The sponsor is Senator West, of Louisiana.

THERE was a painful lack of harmony between the stockholders and the Directors of the Direct United States Cable Company at their last meeting, owing to the difference of opinion which existed with respect to the prospective result of the enterprise. The Directors asked for power to raise funds for the manufacture and submergence of another cable, to offer as security the one now in hand for the payment of the second, and threatened, if their recommendations were not followed, to "wash their hands of the consequences." The stockholders' views were that money could not be raised for this purpose except at a ruinous rate of interest, even if they had a perfect working cable to mortgage as security, and refused at that time to grant the authority asked for. The meeting was then adjourned for two weeks.

It is evident that the original promoters of this enterprise have lost faith (if they ever had any) in the sanguine results set forth in the first prospectus issued to the public. The glowing visions therein contained have been rudely dispelled, and it now begins to be plain to the stockholders that statements based upon hope are not as reliable as those founded upon scientific knowledge and experience.

Meanwhile, the cable is not yet laid.

HON. EZRA CORNELL.

Art is long and Time is fleeting,
And our hearts, though stout and brave,
Still like muffled drums are beating
Funeral marches to the grave.

Morse, Vail, Gale, Kendall, Cornell, the inventor and his aids, are all dead. The last named is being carried to his final rest in Ithaca, N. Y., as we write. At the age of 67, when the richness of the autumn years was settling upon him, and the fruit of his life seemed to have ripened into permanent amplitude, Ezra Cornell, is carried to the grave. After acquiring a large fortune by his ownership of telegraphic property, acquired early in its history, and devoting a large portion of it to the establishment of the great university which bears his name, and to the erection of a munificent public library in the town of his home, his life was complete, and so he dies. Death, under such circumstances, cannot be said to be premature. Few men's fortunes have borne so abundant fruit in the work of elevating mankind.

Mr. Cornell was born at Westchester Landing, N. Y., Jan. 11, 1807. At the age of 21, he went to Ithaca, N. Y., where he has ever since resided. His earliest occupation there was in the machine shop belonging to the cotton mill of Otis Eddy, which occupied the very site where now stand the stately buildings of Cornell University. Through the acquaintance of Hon. F. O. J. Smith, Chairman of the Committee of Commerce of the House of Representatives, in Washington, who was owner of one-fourth of the Morse patent, he became connected, in 1844, with the work of erecting the experimental line of telegraph between Baltimore and Washington, acting as superintendent of construction. Since that time he has devoted himself, until a comparatively recent date, to telegraphic pursuits, and many of the original lines, especially in the West, were erected by him. In the scheme projected in 1850, chiefly by J. H. Wade, of Cleveland, and Hiram Sibley of Rochester, of massing the leading telegraph properties into a single company, the lines built by Mr. Cornell through Michigan and elsewhere, became important, and were incorporated into the system of the present Western Union Telegraph Company. This was the foundation of Mr. Cornell's colossal fortune. Wisely retaining the stock issued to him, it multiplied and increased in value until he became rich. It was then that, recollecting the years of his boyhood, when he struggled toward manhood with limited education, and without the aids to acquire it which he now saw possible to provide for others, he conceived the idea of endowing a grand institution where instruction in any study, to any person, could be given. To this idea of a university he has devoted the last ten years, planning with consummate perseverance, and in consultation with the most experienced minds, the foundations on which it was to rest. By a gift of \$500,000 he secured for it a State appropriation of 989,000 acres of valuable western lands and a generous charter from the State of New

York, and he also presented 200 acres of land as the site of the University and a College of Agriculture in connection therewith. He also made other gifts amounting to about \$100,000, besides transferring to the institution the Jewett geological collection which had cost him \$10,000. Thus nobly, and broadly, and generously has this man who, without the advantages of early culture, and with the refinement only which was the product of an honest purpose and a manly understanding, made his life coronal and his name immortal.

We have little more to say of Mr. Cornell as a man. He was without brilliant qualities. There was little of poetry or joyousness in his nature. He was remarkable chiefly for strong convictions, a sinuous integrity, exactitude, fidelity in details, sound, stern judgment. He was a rigid economist both in his own living and in all he did, and yet in the breadth of plan and in the amplitude and method of the organization of the University, Mr. Cornell developed a comprehensiveness which justly entitles him to greatness. His personal frugality appears to us now as a sacrifice to a sublime design. In this view of him the public will remember and regard him. In the care and determination with which he arranged all the details of the endowment and management of the institution, and the fact that his death leaves no provision for it incomplete or doubtful, there are the characteristics of a broad, enlightened and powerful will. No narrow mind could have done this. As a friend Mr. Cornell was true, and in all his social relations reproachless and affectionate.

It is a source of pride to us to know that through Mr. Cornell and others the fruit of telegraph enterprise has yielded so abundantly to education. On the grounds of the Cornell University, stands a noble structure, the gift of Hiram Sibley, Esq., and one of still finer architectural beauty from the same donor is about completed on the grounds of the growing University at Rochester, N. Y. Other large charities elsewhere attest the fruitfulness of the telegraph enterprise in America in the elevation of society. It should not indeed seem strange that the fortunes which have followed the success of the great scientific gift which covers the world to-day with highways of thought and commerce, should find their legitimate employment in the endowment of just such institutions as that which must for ever commemorate and embalm the name of Ezra Cornell.

QUADRUPLIX TELEGRAPH.

The Quadruplex Telegraph has been in successful operation between New York and Chicago during the past two weeks, and has satisfactorily performed the work of four wires upon one. When the traffic between New York and Chicago is not sufficient to keep the whole facilities of the Company employed, the Quadruplex is employed as two through wires to Chicago, and as two wires from New York to Buffalo and two wires from Buffalo to Chicago, and thus twelve operators are employed in transmitting and receiving messages upon one wire without drops.

The two New York and Chicago operators at each end of the line, who are simultaneously sending and receiving messages over the whole length of the wire, are as unconscious of the use of a section of the same wire by Buffalo and New York in the simultaneous interchanging of their business, and of the use by the Buffalo and Chicago operators for a similar purpose of another section, as if they were all operating separate and distinct wires. A large number of Quadruplex apparatus is now being manufactured at the Company's manufactory in this city, and will be put upon all the principal circuits as soon as completed.

TREATMENT OF UNCOLLECTIBLE MESSAGES.

The regulation in regard to the treatment in the accounts of collect messages which are uncollectible appears to be habitually disregarded by many offices, thereby causing much unnecessary expense and trouble in the settlement of Error sheets and "Uncollects." It should be distinctly understood that, in recording a message, its check should be entered precisely as it was transmitted; and under no circumstance should a message once sent collect be entered in the checked receipts as paid. When the charges upon a message which has been sent collect are uncollectible at the receiving station, and are then collected at the sending office, the latter should still check the office to which it was sent, and account for the amount collected in its guaranteed account. The office receiving should check itself with the amount, crediting the sending office, and return the same in the uncollected account as a disbursement.

This is the spirit of Rule 77, and when it is not carried out errors arise in accounts between offices, service messages burthen the wires, and it not unfrequently happens that the postal expense incurred in correcting the fault amounts to a larger sum than the amount involved, beside the extra labor imposed in comparing the accounts and writing communications. This business hereafter must be conducted in accordance with the regulations of the service.

It will be seen from the report of President Orton to the Directors of the Western Union Company, at their semi-annual meeting on Dec. 9th, that, as compared with 1873, there has been, in 1874 an increase in the net profits of the Company of \$841,643.51. The continued growth of the business and the perfection of telegraphic apparatus is so encouraging that Mr. Orton believes that it will be practicable, within the next few years, to reduce the present maximum rate of \$2.50 to \$1 for day messages, and that then there will be but four rates, viz., 25 cents, 50 cents, 75 cents and \$1, and half these rates (excepting the lowest) for night messages.

On and after January 1st, 1875, the United States postage on the JOURNAL OF THE TELEGRAPH will be prepaid at this office.

PRESIDENT ORTON'S SEMI-ANNUAL REPORT.

The semi-annual meeting of the Board of Directors of the Western Union Telegraph Company was held on Wednesday, December 9th. The following is the report of the President, and the resolutions adopted by the Board.

EXECUTIVE OFFICE,
WESTERN UNION TELEGRAPH COMPANY,
New York, December 9, 1874.

To the Directors:

The Report made to the stockholders at their annual meeting, on the 14th of October last, contains a full statement of the operations of the Company for the fiscal year ended June 30th, 1874, and of its condition on that day. Printed copies of this Report being now before you, I shall not repeat much of its details in this paper.

At the Semi-Annual Meeting of the Directors, held on the 3d day of June last, I submitted a statement in which the profits (partly estimated) for the three months ending June 30th were put down at \$740,000, together with a recommendation from the Executive Committee that a dividend of two per cent. be declared, payable out of the profits of that quarter. The actual profits for that quarter, as subsequently ascertained by the official returns, were \$762,029.44.

At a meeting of the Executive Committee held on the 1st day of September last, a dividend of two per cent. for the quarter ending September 30th was declared, based upon estimated profits for the quarter of \$825,000. The actual profits were \$822,316.04.

The profits for the current quarter, ending December 31st instant, of which we have complete returns for the month of October, and nearly complete for November, are estimated by the Auditor at \$856,527.08. After careful revision, I have deducted \$15,000 from the Auditor's estimates, which gives \$841,527.08 as the profits for the quarter.

The following is a comparative statement of Receipts, Expenses and Profits for each month of the calendar years 1873 and 1874.

	RECEIPTS.		EXPENSES.		PROFITS.	
	1873.	1874.	1873.	1874.	1873.	1874.
January.....	740,061 86	743,873 36	537,381 54	550,735 23	202,679 04	193,137 76
February.....	700,435 14	681,761 11	443,291 73	491,784 15	257,143 36	190,976 96
March.....	732,996 34	761,979 34	543,218 72	504,285 88	189,777 62	257,693 51
April.....	704,483 91	770,961 12	622,289 92	546,738 65	172,193 99	224,223 47
May.....	767,770 01	788,848 96	634,546 35	607,682 07	133,223 66	181,166 89
June.....	774,801 56	783,215 05	638,298 43	636,554 87	146,503 13	146,660 08
July.....	784,999 08	806,973 05	623,568 00	657,744 51	161,431 01	149,228 54
August.....	705,999 08	797,910 91	604,788 03	631,144 51	101,211 01	166,766 40
September.....	806,117 95	888,548 99	646,973 46	645,285 97	159,144 47	243,263 02
October.....	832,156 86	883,678 74	638,904 63	677,151 06	193,252 03	206,527 08
November.....	731,416 96	835,000 00	545,475 90	600,000 00	185,941 06	235,000 00
December.....	9,232,083 66	9,530,749 55	536,207 61	565,000 00	195,876 05	270,000 00
			6,454,088 76		2,235,017 28	6,476,000 79
1874.....	\$9,530,749 55		\$6,454,088 76		\$3,076,660 79	
1873.....	9,232,083 66		7,047,016 33		2,235,017 28	
	\$943,715 89		\$593,927 02		\$841,643 51	
	(Increase.)		(Reduction.)		(Increase.)	

It appears from this exhibit that the gross receipts for the current year are \$9,530,749.55, against

\$9,282,033.66 for 1873, showing an increase of \$248,715.89 for the current year, while the expenses have been reduced from \$7,047,016.88 in 1873 to \$6,454,088.76, being a difference of \$592,927.62 in favor of the current year, and that the profits are \$3,076,660.79, against \$2,235,017.28, being an increase of \$841,643.51 over the profits of 1873.

In view of the facts above stated the Executive Committee, at their regular meeting on the 2d instant, passed a resolution recommending that the Board at this meeting direct a dividend of two per cent. to be made out of the profits of the current quarter.

The year 1874 has been notable for the general dullness in every department of business, which has prevailed in all sections of the country. The fact that we have been able during the year to increase receipts and reduce the expenses of the Company, so as to yield a net profit of nearly 40 per cent. in excess of the preceding year, may be accepted as an indication of what the results will be when the business of the country shall have resumed its accustomed activity. The results of our operations this year also seem to confirm the wisdom of the policy which the managers of the Company have steadily pursued for several years past, of extending the lines, increasing the facilities, reducing the rates, and so improving the character of the service as to induce the public to increase their use of the telegraph.

On the 1st day of February, 1873, the maximum tariff between the most remote points on the Company's lines was fixed at \$2.50. This was equivalent to a reduction of more than 50 per cent. on messages between the Atlantic and Pacific States, the rates having previously ranged from \$5.00 to \$7.50. The first effect of this reduction was a considerable loss of revenue. But for several months past the revenue from messages between the Atlantic and Pacific States has been larger than during any corresponding period before the rates were reduced, and we have been able to transmit the increased volume of business with even greater promptness than before, without the addition of a single wire to the trans-continental line. This result is largely due to the successful operation of the Duplex apparatus, of which I have spoken in previous reports.

In my last annual report to the stockholders, I stated the fact that we were then operating between New York and Boston, and had been for about two weeks previously, an apparatus called the Quadruplex, by means of which two messages were sent in the same direction, and two other messages in the opposite direction upon one wire at the same time. Since that time the inventors, Messrs. Thomas A. Edison and George B. Prescott, have so far perfected the apparatus that it is now working successfully on a direct circuit between New York and Chicago. The great success of this invention within so short a time after its introduction leads me to believe that we shall be able to put it upon routes between all stations where the business requires the use of either two or three or four wires. If the further experiments about to be made shall demonstrate the ability of this apparatus to work satisfactorily through the long circuits of the lines to the Pacific, thereby increasing the capacity of those lines, without involving any expense for additional wires, I shall be inclined to recommend a further reduction of the present maximum rate of \$2.50. Indeed, such is my confidence in the growth of the Telegraph business within the next few years that I believe it will be practicable for the Company to continue reducing the higher rates, and extending the distances to which the lower rates are applied, until we shall ultimately have but four rates for day messages, namely: 25 cents, 50

cents, 75 cents, and \$1.00, and half these rates (excepting the lowest) for night messages, and that this result can be gradually accomplished without impairing the Company's ability to pay satisfactory dividends to the stockholders.

Mention was made in my Annual Report of the fact that the cable of the International Ocean Telegraph Company, which connects the coast of Florida with Cuba, was interrupted between Punta Rasa and Key West, and that efforts were then being made to repair the break and restore communication. I now have the pleasure to report that by the aid of the I. O. T. Company's steamer "Professor Morse," Mr. N. De Bree, the agent of the Company at Key West, has thoroughly overhauled the cable, cut out several defective parts and brought it into perfect working order. On account of this success efforts are now being made to recover and restore another cable between those points, which failed and was abandoned three years ago.

Respectfully submitted,

WILLIAM ORTON,
President.

The following resolutions were unanimously adopted:

Resolved, That a dividend of two per cent. from the net earnings of the three months ending December 31st, be and the same is hereby declared payable on the 15th day of January next.

Resolved, That for the purpose of such dividend the stock books be closed at three o'clock P.M., on the forenoon of the twenty-first instant, and be opened on the morning of the 16th of January.

THE TAXATION OF TELEGRAPH COMPANIES.

The Supreme Court of Indiana has decided that the tax on \$800,000, assessed on the capital stock of the Western Union Telegraph Company by the State Board of Equalization, cannot be collected. In their opinion, the court say they see no reason why the whole amount of the company's capital stock (\$40,000,000) should not be taxed in Indiana if the \$800,000 assessed can be legally taxed—intimating that the Legislature cannot provide for the taxation of the stock of foreign corporations. From so much of the opinion Judge Buskirk dissents, holding that the Legislature has this power, but that the law under which the assessment is made does not fully cover the necessary ground to be taken.

NEW POLICE AND FIRE TELEGRAPH LINES IN BROOKLYN.

A new and superior telegraph line has recently been constructed in Brooklyn for the Police and Fire Departments, extending from Fulton avenue, through Reid avenue, to Bushwick avenue; from Reid and Green avenue on Green to Broadway; and from Reid and De Kalb avenues to Nostrand avenue on De Kalb, two and three quarter miles long.

Another line has also been built from the Fifth Precinct Station House through Ten Eyck, Hope, Ewen and Second streets, to Wyckoff street, Williamsburgh, (where it connects with other lines), one and a half miles long. The total of new line is five and a quarter miles.

The poles are thirty-five feet in length, with No. 9 English galvanized wire, and screw glass insulators, on cross-arms.

THE ARIZONA MILITARY LINE.

In his Annual Report the Secretary of War states that the line of military telegraph from San Diego, Cal., to Prescott and Tucson, Arizona, provided for by the Act of 1873, which appropriated, upon an estimate of this department, \$50,311.80 for its construction, was built by labor of troops, using the means of transportation of the Quartermaster's Department. The line is 540 miles long, and cost \$45,000. The balance of the appropriation remains unexpended. As a surplus of wire remained unused on the completion of the line, it was used to extend the telegraph to Camp Verde. By this line, cheaply constructed, the principal posts in Arizona are placed in immediate communication with each other and with the headquarters of the Department of Arizona, of the Military division of the Pacific, at San Francisco, and with the War Department.

POPULATION OF THE UNITED STATES.

The first census of the country was taken in 1790, and decennial censuses have been taken ever since. An estimate has been made for the ten years previous to 1790, from the data of years 1790, 1800, 1810 and 1820. An examination of these years exhibited successively, by subtraction, two second differences that were nearly equal, so much so as to indicate in general, as the law of their progression, approximately, constant second differences. From the average of these second differences, treated as a second difference for completing the series, the population for the year 1780 was estimated at 3,070,000.

The present and prospective population of the United States is as follows:

1870.....38,558,371	1876.....45,316,000
1871.....39,555,000	1877.....46,624,000
1872.....40,604,000	1878.....47,983,000
1873.....41,704,000	1879.....49,395,000
1874.....42,856,000	1880.....50,858,000
1875.....44,060,000	

The telegraph is being introduced in Turner's Falls, Mass. The other day hardly five minutes had elapsed after the erection of one of the posts before some enterprising genius posted a bill thereon, and soon two street Arabs were attracted to the spot, when the following dialogue ensued: "I say, Mickey, what an invention the telegraph is." "Yes, an' here's a dispatch broke out on the post."

A CARD.

THE METALLIC GALVANIC BATTERY.

A Notice having been extensively published and circulated announcing the appointment by Edwin Eagles of another firm as sole agents for the manufacture and sale of the Metallic (or Lead) Galvanic Battery, known to the trade as the "Eagles Metallic Galvanic Battery," and enjoining all other parties from manufacturing or selling the battery, we take this method of informing the public of our position and rights in regard to said battery.

At the time the notice referred to was prepared and published it was well known to Eagles, as well as to us, that his application for a patent on the battery had been rejected more than a year previous, on the ground that the applicant was not the original inventor.

The original inventor of the battery now has an application pending in the Patent Office for a patent on his invention, which we have no doubt will be granted, and which, when issued, will be controlled by us.

In any case the notice is preposterous, as in no event can a valid patent possibly be issued to any other than the original inventor.

We continue and shall continue to manufacture and sell said Metallic Galvanic Battery, and parties purchasing of us will be fully protected in their right to sell and use the same.

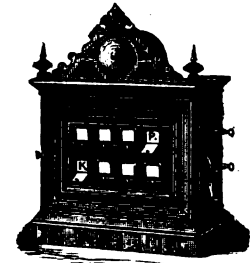
Those who may purchase this battery manufactured by other parties not authorized by us, will be, after the issue of the patent, legally liable to pay royalty to us on battery so purchased from or made by unauthorized parties.

The Metallic (Lead) Galvanic Battery may be had of us, or from Messrs. L. G. TILLOTSON & Co., who are our agents for its sale, at our prices, and who will guarantee against infringement in any battery that they sell.

F. L. POPE & CO.,
New York, Dec. 9, 1874. 38 Vesey Street.

CHAMPION

Burglar Alarm & Annunciator Company, 40 West 18th St., New York.



We invite Telegraph Managers and Operators throughout the country to act as our Agents for the introduction of our Superior Burglar Alarms and Annunciators into Private Houses, Hotels, Banks, &c.

Upon receipt of plans of houses, we will send skilful mechanics to estimate upon work or will give any information in writing that may be required. Liberal commissions will be paid upon any orders that may be secured for us.

Our Alarms and Annunciators have just been awarded the First Premium of the American Institute.

Explanatory Circulars will be furnished upon application to the Secretary.

L. G. TILLOTSON,
President.

CORNELIUS ROOSEVELT,
Sec'y and Treas.,
40 West 18th Street, N. Y.

CALIFORNIA AGENCY

FOR

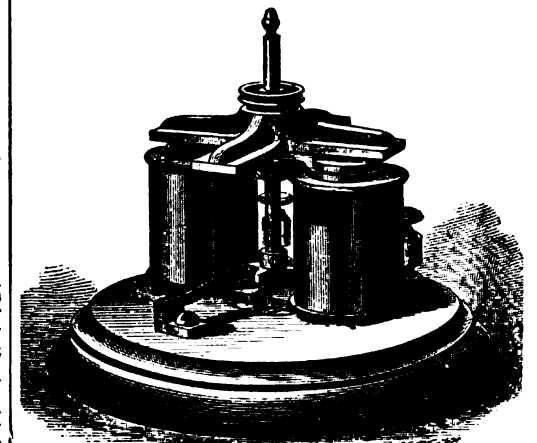
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Relays, and Regular Relays.

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GEO. M. POMEROY, San Jose, Cal.

SOMETHING NEW!



[PATENTED SEPT. 29, 1874.]

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A perfect working model of an engine Run by Electricity!
It will work well with an ordinary local battery.

Price, with two cells Eagles' Metallic Battery.....\$6 00
" without Battery..... 4 00

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